GENE PEARSON

fine tuning's
PROCEEDINGS 1988

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COVER DESIGN

The left-hand portion of the cover drawing is the negative image of part of a Very Large Scale Integrated Circiut. The right-hand portion is the negative image of a drawing of a traditional leather puppet used in the famous Indonesian "wayang kulit" shadow puppet plays.

fine tuning

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ABOUT THE AUTHORS AND EDITORS

ABOUT FINE TUNING

introduction

introduction

On **fine tuning's** 10th Anniversary, the editors surveyed all US subscribers to identify how **fine tuning** might better serve the individual subscriber's hobby needs and how we might better serve this very special avocation which we all love - - Shortwave Radio Broadcast DXing.

The **fine tuning** Survey was done in the Summer of 1987 and indicated, among other things, a very high level of interest in articles on a wide variety of subjects. This was not surprising for we all knew of the lack of in-depth information available to us. In contrast, the hobby of medium wave DXing affords a multitude of articles and reprints supplied by major clubs; amateur radio is well supported by an extensive professional hobby press.

Those surveyed expressed interest in subjects ranging from equipment reviews and antenna articles to tuning techniques and advanced propagation theory. Luckily, the Survey also identified a number of willing and very qualified authors; so, the **FT** management began an entirely new effort to support the hobby of SWBC DX. The result of that year-long effort is this **fine tuning** Special Publication: **PROCEEDING'S 1988**

This first publication of Proceedings is drawn entirely from **fine tuning's** own subscribers who so foolishly volunteered in the Survey. Authors were initially contacted by Proceedings Senior Editors John Bryant and Fritz Mellberg and were asked to submit rough drafts of specific articles for consideration by an Editorial Reivew Panel. The Review Panel was a group of senior SW and MW DXers drawn from Survey volunteers and from other individuals whose available time, interest and experience matched the subjects to be reviewed. This panel then reviewed the rough articles and made suggestions for revisions and improvement. Authors then produced the final "camera ready" copy which you have before you.

We wish to stress that PROCEEDINGS is not intended as an entry level primer for the hobby. A number of books and publications from the major radio clubs perform that function quite well. The articles in PROCEEDINGS are intended to be of interest to those with a long term committment to the hobby...the so called "hard core" of SWBC DXing.

Finally, there are many people who deserve thanks for their involvement in this effort. The two Senior Editors would like to extend our warmest gratitude to the authors of these articles. Most of them are first time authors. They willingly submitted their initial work to a review and editorial process as rigorous as those in the scholarly scientific and engineering societies from whom this process was barrowed. Further, Fritz Mellberg, who has a good deal of experience as a print journalist, gave each artical an editorial once-over worthy of a City Editor. The red ink resulting from this combination must have been difficult for our corps of authors. However, each responded magnificently; we believe that the articles resulting from this process reflect its rigor and depth. We, as Editors, are grateful to have authors who turned out to be such "old pro's".

John H. Bryant, AIA
Senior Editor

Fritz Mellberg
Senior Editor

AN INVITATION:

Of nesessity, Proceedings 1988 was made up of articles from **fine tuning's** own subscribers who volunteered in the Subscribers Survey of 1987. However, we are already beginning to plan for Proceedings 1989. We hope that Proceedings will become a forum of discourse, a medium of communication and a working resource developed by and for senior SWBC DX'ers. Our intention is to concentrate on in-depth articles which are generally too long or too narrowly focused to be published in normal club bulletins.

We feel that future authorship **should not be limited to fine tuning subscribers.** Neither should authorship be limited to DXers currently residing in North America. We would be honored to accept articles for Review from the DXing communities in South America, Europe, Asia and Oceania, as well as from this continent.

In general, we will be categorizing articles in future Proceedings similarly to this issue: Propagation, Antennas, Receivers, Peripheral Equipment, Computers and Features. Although articles in any of these categories would be welcome, we specifically seek more articles in propagation theory, loops, rhombic and very tall vertical antennas, and in-depth user reviews of the major current 'top of the line' receivers. In the area of Peripheral Equipment, antenna tuners, preselectors and state-of-the-art solid state pre-amplifers all need further exposure. Additionally, someone in our hobby must have had access to, or experience in, the types of signal processing used in Remote Sensing and other telecommunication functions. Is this or some other kind of audio processing the next logical step in making inaudible signals understandable?

We could also use further articles similar to our two 1988 computer articles. We wish to publish articles dealing with the use of "home" computers as DXers' tools, not as hobby objects in their own right. Any volunteers?

Finally, we actively seek major station or network profiles and futher regional articles very similar to "DXing New Guinea."

The Due Date for rough draft Review submissions for Proceedings 1989 is February 1, 1989. We would like to discuss your work with you well prior to that time.

If you would like to become involved in **fine tuning's Proceedings 1989**, please contact:

fine tuning/Special Publications
John H. Bryant
RRT #5 Box 14
Stillwater, OK 74074
USA

A PERSONAL NOTE

Of the many people who contributed to this publication, I'd particularly like to thank Fritz Mellberg. He certainly earned his title of Senior Editor. I'd also like to also thank the members of the Review Panel who performed a truly thankless task with tact, perception and speed. Most of all, I'd like to express my personal appreciation to **fine tuning's** especially **fine** Managing Editor, Mitchell Sams. Mitch is an excellent leader, encouraging and supporting the rest of the staff through thick and thin. Further, it was Mitch himself who had THE IDEA that finally broke our mental log jamb about how **fine tuning** could be an inovator in hobby journalism. Mitch is truly the godfather of PROCEEDINGS. JHB

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Branchville, New Jersey

Charles Bolland
West Palm Beach, Florida

John H. Bryant
Stillwater, Oklahoma

David M. Clark
Newmarket, Ontario

Mark Connelly
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Nicholas Hall-Patch
Victoria, British Colombia

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Mexico D. F.

Frederich Mellberg
Hawarden, Iowa

R. Charles Rippel
Virginia Beach, Virginia

Mitchell A. Sams
Wichita, Kansas

John Tow
Pinson, Alabama

propagation

TERMINATOR MECHANICS AND TRANS•POLAR SOLAR BLANKING

JOHN H. BRYANT

The ability to visualize the ever changing sunrise/sunset lines across the globe throughout the year is one of the most valuable skills for any DX'er. The sunrise/sunset lines are more generally known by their astronomical name: terminator lines. Discussion of how these lines relate to the planet and to specific locations on it is known as terminator mechanics. Understanding the Earth's terminator mechanics and its implications on radio propagation can make each of us better DXers.

The Earth's axis of rotation (through the North and South poles) tilts at about 23° to the imaginary disc created as the Earth rotates about the sun (our plane of rotation). This axial tilt causes a number of effects which are of interest to DX'ers. The first and most well known effect is, of course, the seasons. The longer days of summer and shorter days of winter and the accompanying changes of temperature and weather are directly attributable to the axial tilt of our planet. Another major effect is the changing time of sunrise and sunset (SR/SS) through the year. You should note that SR/SS times do not change at the equator; they change ever more rapidly as you move away from the equator and toward the polar regions. (see END NOTE).

One basic tool for visualizing terminator mechanics is the "DX EDGE". The DX Edge is an 11 1/2" x 5" plastic slide-rule-like device, with an opaque background element, showing a Miller Cylindrical Projection of the world, and interchangeable sliding overlays, one for each month, which show the area of sunlight, darkness and the SR/SS terminator. This device is extremely useful for any shortwave listener, since the reflectivity of the ionosphere and, therefore, radio wave propagation is effected radically by the absence or presence of sunlight.

Examining all twelve monthly overlays for the DX Edge, it is easy to see that the angle of the terminator line/plane changes from +23° to -23° with respect to the earth's axis during the year. Knowledge of this change of angle is one of the handiest tools for the DX'er. For instance, in Central North America, since the dawn terminator "lags behind" to our south in the summer, we can DX western South America even past local dawn here (See Figure 1). Conversely, if you are an Indonesian RRI Freak, you should love dawn in the winter, since the terminator "runs ahead" of us to the south, wiping out those South Americans long before our local dawn. The Indo's then come through without interference (See Figure 2). These subtle seasonal variations in the areas of sunlight and darkness and their inherent DX possibilities become very clear with the regular use of the DX Edge.

The DX Edge has been manufactured by Xantek of New York since 1981. It is available from most shortwave hobby outlets for less than $18.00

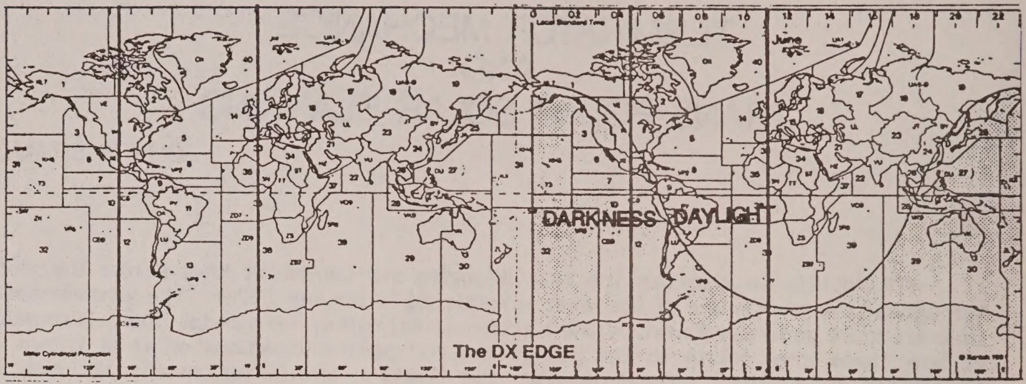

Local Standard Time
June
DARKNESS
DAYLIGHT
The DX EDGE
Miller Cylindrical Projection

FIGURE ONE

The SR/SS situation at dawn in central North America on 15 June each year. Note that during the last hour before dawn, most of South America is "open" and none of mainland Asia is available. Note that the slope of the Terminator at the Equator is equal to the 23° tilt of the planetary axis to the plane of rotation.

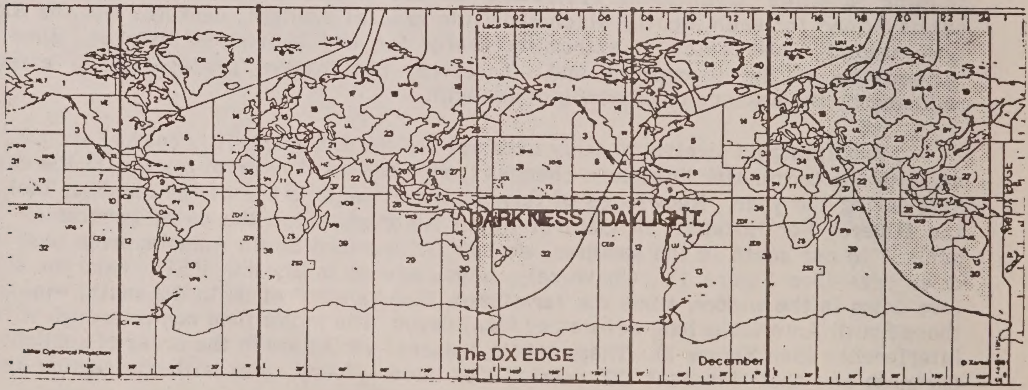

Local Standard Time
DARKNESS
DAYLIGHT
The DX EDGE
December
The DX EDGE
Miller Cylindrical Projection

FIGURE TWO

The SR/SS situation at dawn in central North America on 15 December each year. Note for the last hour before dawn, that almost the entire land mass of Asia is "open for Tropical Band reception while the South American Stations have long been absorbed by the daytime "D" layer of the ionosphere.

One major weakness of the DX Edge is that it perpetuates a dangerously distorted mental picture of our planet. We were all introduced to this distorted view by Mercator projection wall maps in primary school. The DX Edge, like most of our shack maps, uses a modern version of the Mercator projection called the Miller Cylindrical Projection. This view of our planet is dangerous for DXers because it badly distorts most of our planet's "Great Circles." A Great Circle is simply the circle of intersection between a sphere and a slicing plane which passes through the center of the sphere. Slice an orange at any angle that you want it, so long as you divide it exactly in half, and the cut orange rind is a Great Circle.

Another way to imagine Great Circles is that they are "circumference" circles on a sphere. The Equator is an example of a Great Circle. However, remember that Great Circles (unlike the Equator) can run through any location on the surface of a sphere and at any angle. The shortest distance between two points on any sphere is along a segment of the Great Circle which connects those two points. Because of this fact alone, over the over - the - horizon radio waves which we receive travel to our antennas along Great Circle routes. (SEE END NOTES) Also, our SR/SS Terminator is ALWAYS a Great Circle.

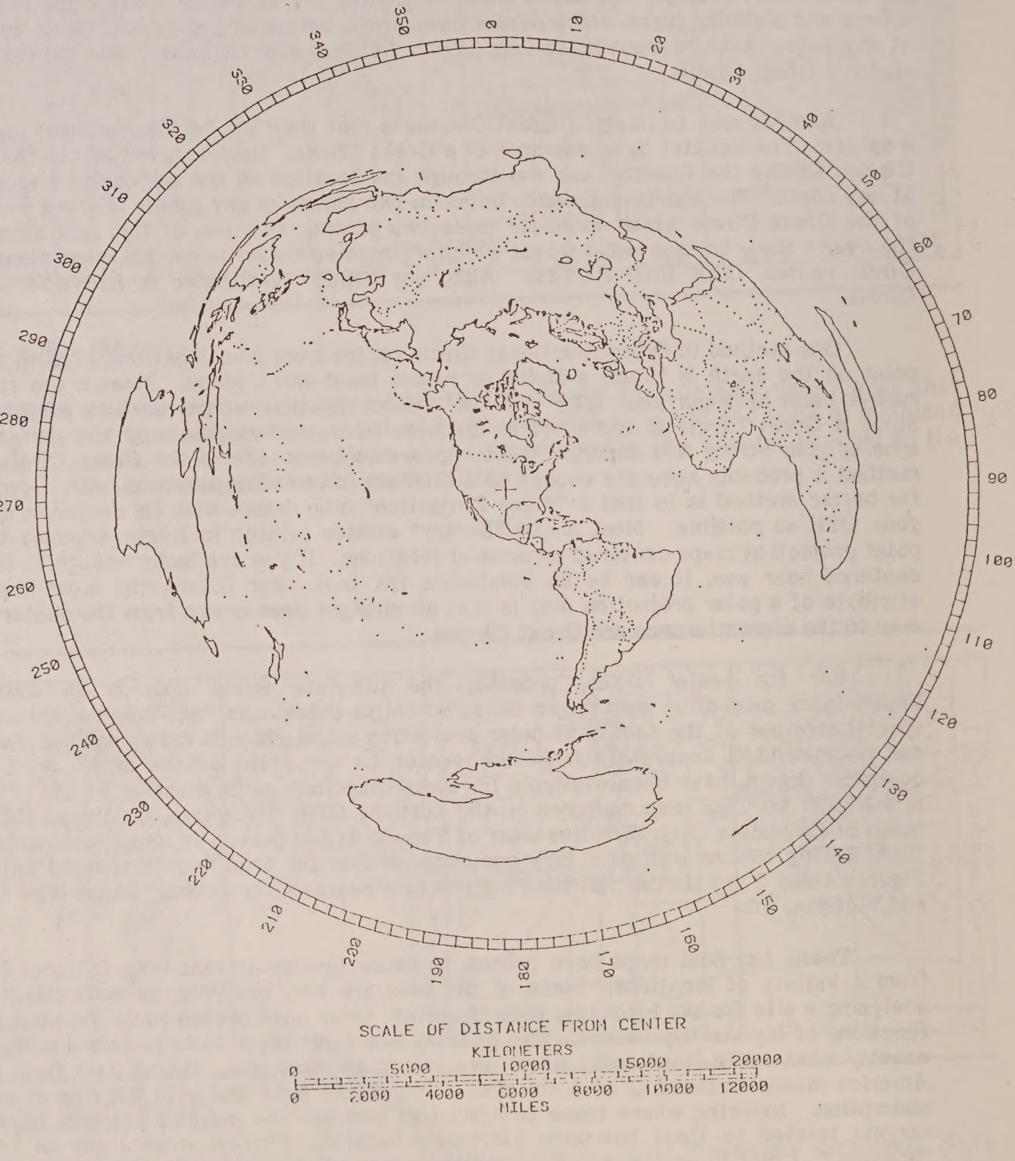
One method to determine Great Circle routes from your location (QTH) to another point on the earth is to use a string or rubber band and a globe. Stretch the string or rubber band between your QTH and the second location on the surface of the globe. Since a Great Circle is the shortest distance between two points on the surface of a sphere, your string will describe what appears to be an arc — the Great Circle. This method is probably accurate enough to aid DXers in orienting antennas, etc. However, a far better method is to find a "Polar Projection" map drawn **with its center** as close to your QTH as possible. Most major "library" atlases printed in North America contain polar projection maps centered on several locations. If you are lucky enough to find one centered near you, it can be an invaluable DX tool. For DXers, the most important attribute of a polar projection map is that **all straight lines drawn from the center of the map to the circumference are Great Circles.**

For the senior DXer, probably the ultimate world map is an Azimuthal Equidistance projection map drawn centered on his shack. An "Azi-Equi" world map is a special member of the family of polar projection maps which is drawn so that distances can be measured accurately from the center to any point on the map. Such maps, computer drawn, have been available for some time from radio amateur N5KR. Figure 3 is a N5KR Azi-Equi map centered on the author's QTH, Stillwater, Oklahoma (50 miles north of Oklahoma City, 60 miles west of Tulsa). It has proven to be an invaluable "real time" DXing tool as well as a very accurate method for orienting directional antennas. Figures 4 and 5 are similar Azi-Equi maps drawn centered on Madang, Papua New Guinea and Victoria, BC.

These Azi-Equi maps have proven to be an invaluable real time DX tool for me from a variety of locations. Some of the uses are very obvious; antenna orientation, analyzing a site for sky blockage, etc. However, these have proven to be the least useful functions of my Azi-Equi maps. The primary use I put them to is to help me vizualize exactly what route "my" radio waves are taking to reach me. DXing Asia from North America means contending with the disk of perpetual light **and with the ring of auroral absorption.** Knowing where those two physical barriers are and how bearings to my DX targets related to them has been extremely helpful. Finally, when I get an unusual "opening." I plot it on the Azi-Eqi, find the exact bearing and search for other targets within 5° of that bearing. It works!

N5KR AZIMUTHAL EQUIDISTANT MAP CENTERED ON

STILLWATER, OKLAHOMA



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260
270
280
290
300
310
320
330
340
350
SCALE OF DISTANCE FROM CENTER
KILOMETERS
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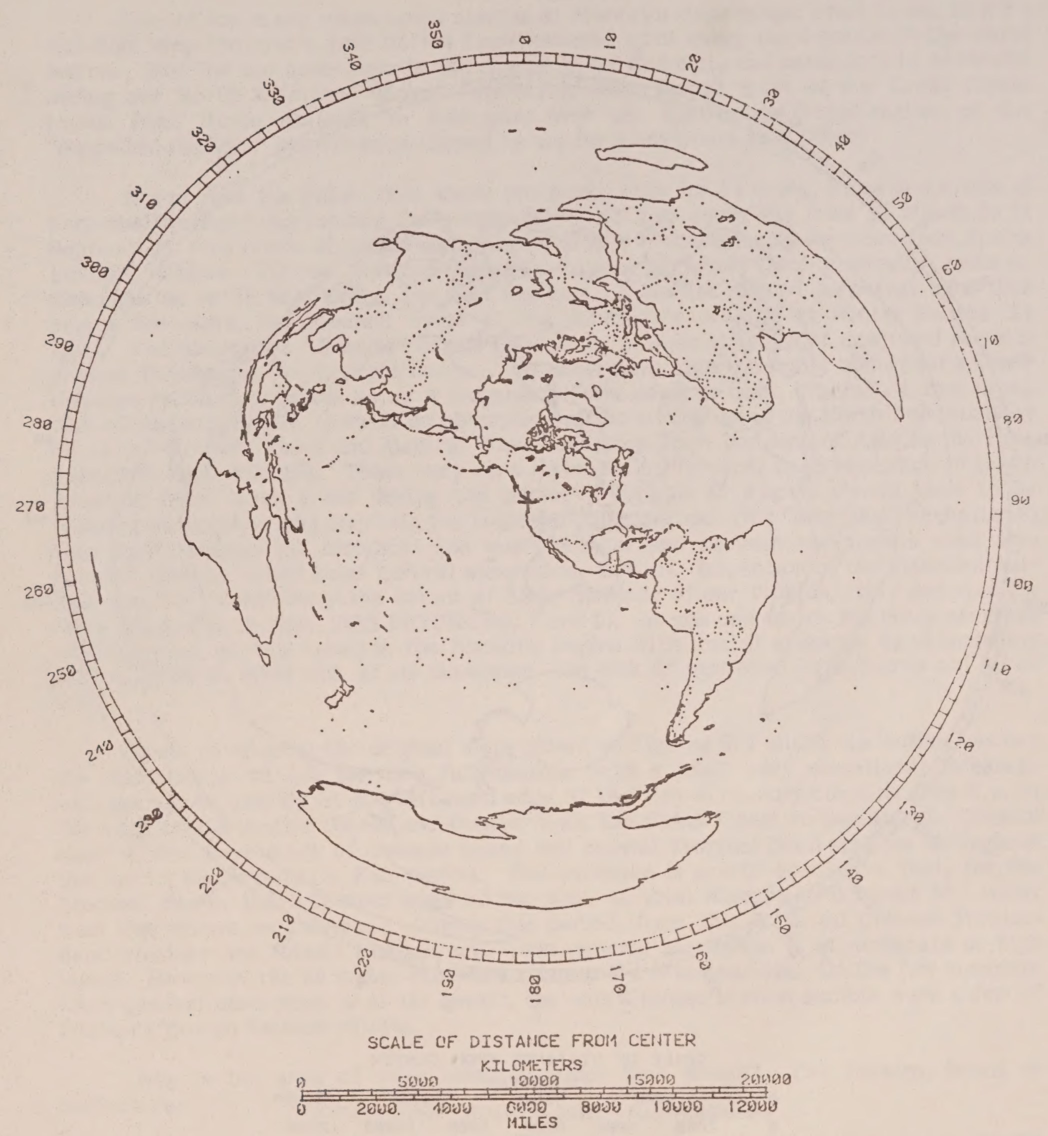
5000
10000
15000
20000
0
2000
4000
6000
8000
10000
12000
MILES

FIGURE 3



N5KR AZIMUTHAL EQUIDISTANT MAP CENTERED ON

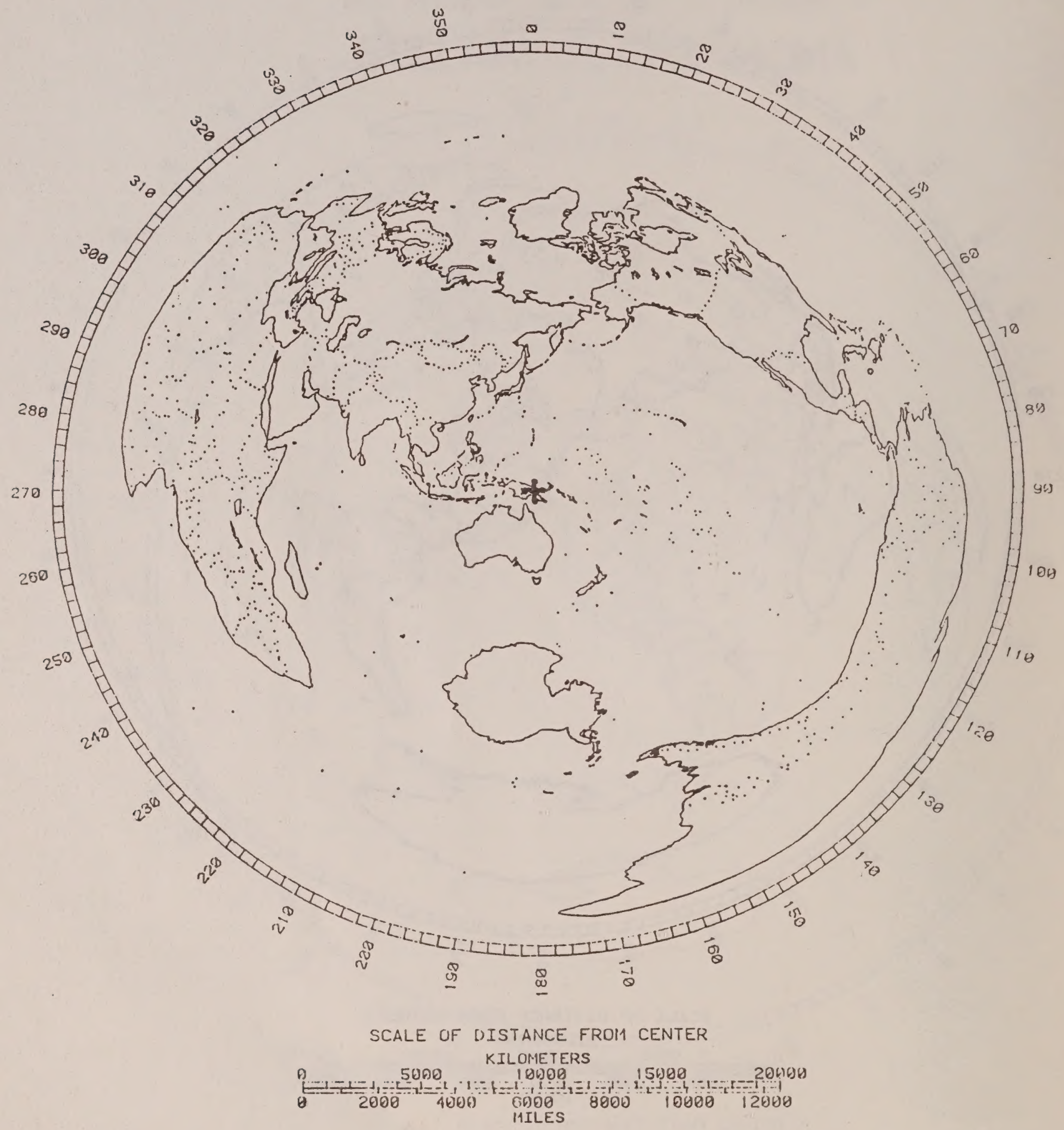
victoria, british columbia

0
10
22
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
192
222
210
220
230
210
250
260
270
280
290
300
310
320
330
340
350
SCALE OF DISTANCE FROM CENTER
KILOMETERS
0
5000
10000
15000
20000
0
2000
4000
6000
8000
10000
12000
MILES

FIGURE 4

N5KR AZIMUTHAL EQUIDISTANT MAP CENTERED ON

MADANG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320
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340
350
SCALE OF DISTANCE FROM CENTER
KILOMETERS
0
5000
10000
15000
20000
0
2000
4000
6000
8000
10000
12000
MILES

FIGURE 5

Trans-polar Solar Blanking

Due to too many years spent staring at Mercator-type maps, I had to use N5KR's Azi-Equi map for over a year before I remembered what every third grader in the world learns: That the sun never sets in the Arctic in the Summer, and never sets in Antarctic during our North American winter. However, even though most of our Great Circle routes from North America to Asia pass over the Arctic, the implications of the "perpetual daylight" phenomenon slipped by me for many years as a DXer!

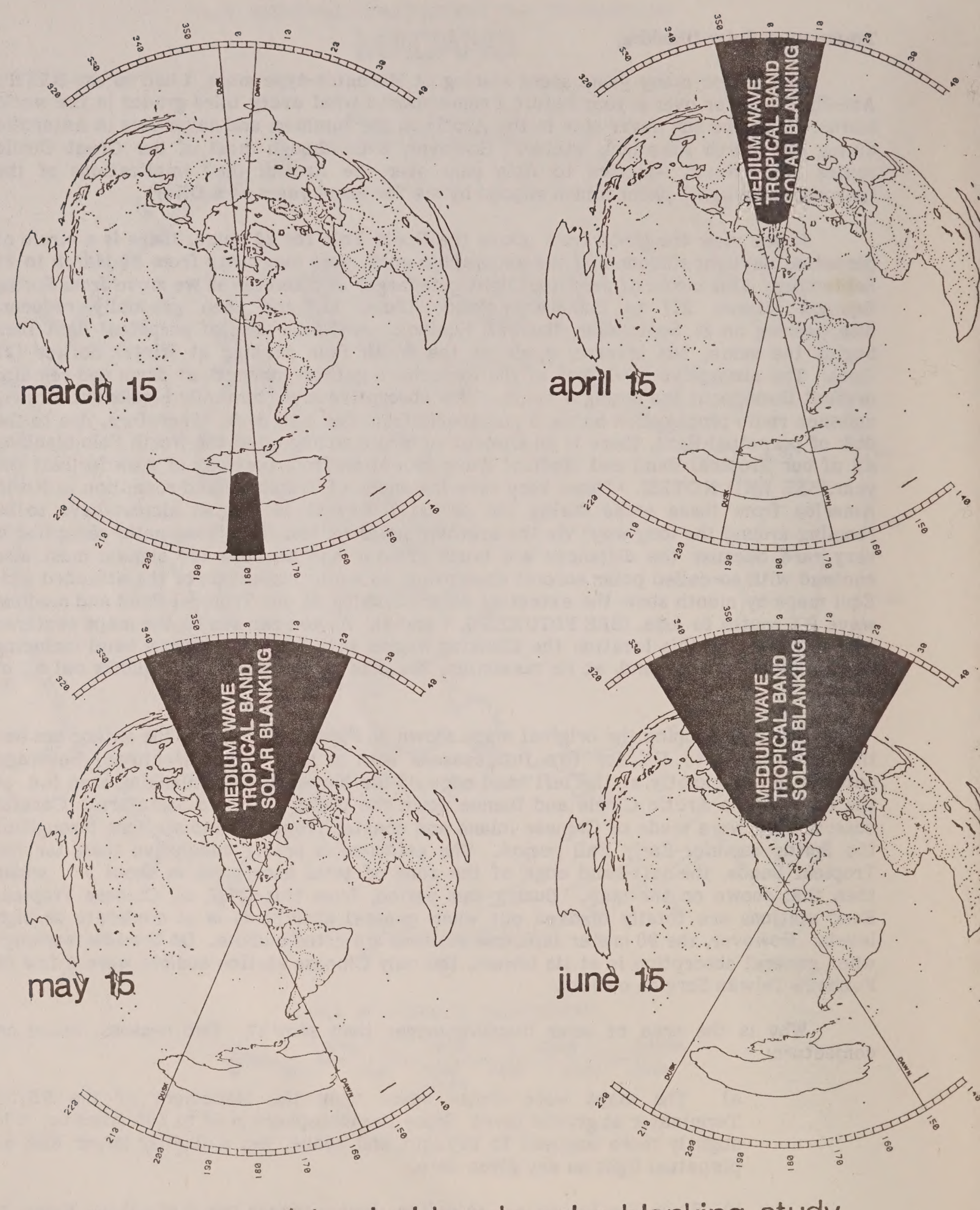
If you view the globe from above the North Pole for 24 hours, there is a circle of perpetual daylight surrounding the geographic north pole every day from 21 March to 21 September. This circle of perpetual light gets larger in diameter as we move from Spring Equinox (March 21) to Summer Solstice (June 21) and then gradually reduces, disappearing on 21 September, the Fall Equinox. A similar disk of perpetual light then begins the same, but inverse, cycle at the South Pole peaking at Winter Soltice (21 Dec). The absorptive "D-layer" of the ionosphere gathers strength at dawn and remains present throughout the daylight hours. This absorptive layer basically blanks out all long distance radio propagation below 8 megaherts from dawn to dusk. Therefore, due to the disk of perpetual light, there is an absorptive circle sitting up at the North Pole blanking all of our Tropical Band and Medium Wave reception from portions of Asia for half the year.(SEE END NOTES). Those very rare instances of Tropical Band reception in North America from these areas during the period 1 May to 15 August almost have to be "coming around the long way" via the southern polar routes. This "long path" reception is very rare because the distances are much greater and because the signals must also contend with so-called polar auroral absorption, as well. Inspection of the attached Azi-Equi maps by month show the extent of Solar Blanking of our Tropical Band and medium wave DX routes to Asia. (SEE FIGURES 6, 7 and 8). As you can see on the maps centered on Stillwater, at this location the blanking begins with loss of a narrow band including central India in April and, at its maximum, the disk of perpetual light blanks out all of Asia.

Since developing the original maps shown as Figures 6, 7 and 8, the author has had the opportunity to DX for two full seasons with a 1200' very directional Beverage antenna aimed exactly at the left hand edge of the May-June-July blanking area (i.e. at the edge of the Arctic Circle and thence down the China Coast to Sumatera). Careful observations were made of Chinese inland and coastal Tropical Band stations throughout the Spring-Summer-Early Fall period. The evidence is pretty conclusive that, for the Tropical Bands, the left-hand edge of the zone of total absorption is about 5° wider than that shown on the map. During this period, from this QTH, all Chinese Tropical Band stations are totally blanked out when general absorption is at moderate or high levels. However, the 80 meter Japanese stations are often audible. On the few mornings when general absorption is at its lowest, the only Chinese station audible were a few of Fuzhou's Taiwan Service outlets.

Why is the area of solar blanking wider than shown? Two reasons, based on conjecture:

a) The maps were drawn based upon the placement of the SR/SS Terminator at ground level. Since the ionosphere is 60 to 100 miles up, it is slightly more exposed to daylight and hence, has a slightly larger disk of perpetual light on any given date.

b) Since the ionosphere is neither homogeneous nor motionless, there is undoubtedly some "leakage" of highly ionized, highly absorptive gases, across the boundaries of the blanking area (it's got fuzzy edges!).


march 15
april 15
may 15
june 15
MEDIUM WAVE
TROPICAL BAND
SOLAR BLANKING
DUSK
DAWN
328
338
348
358
8
18
28
38
48
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150
160
170
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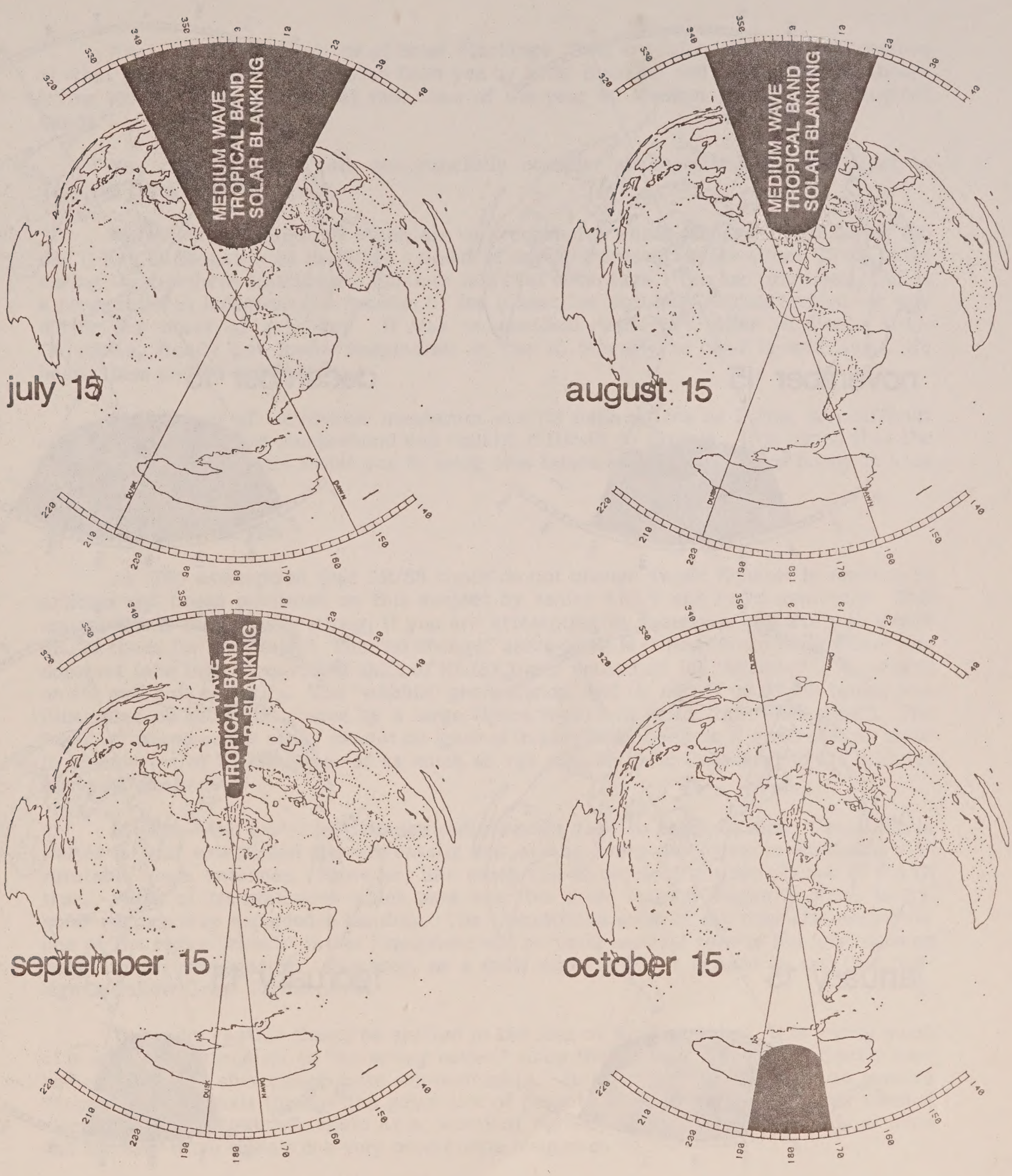
190
200
210
220

mediumwave and tropical bands solar blanking study
centered on
stillwater, oklahoma

FIGURE 6


july 15

august 15

september 15

october 15

MEDIUM WAVE
TROPICAL BAND
SOLAR BLANKING
DUSK
DAWN
320
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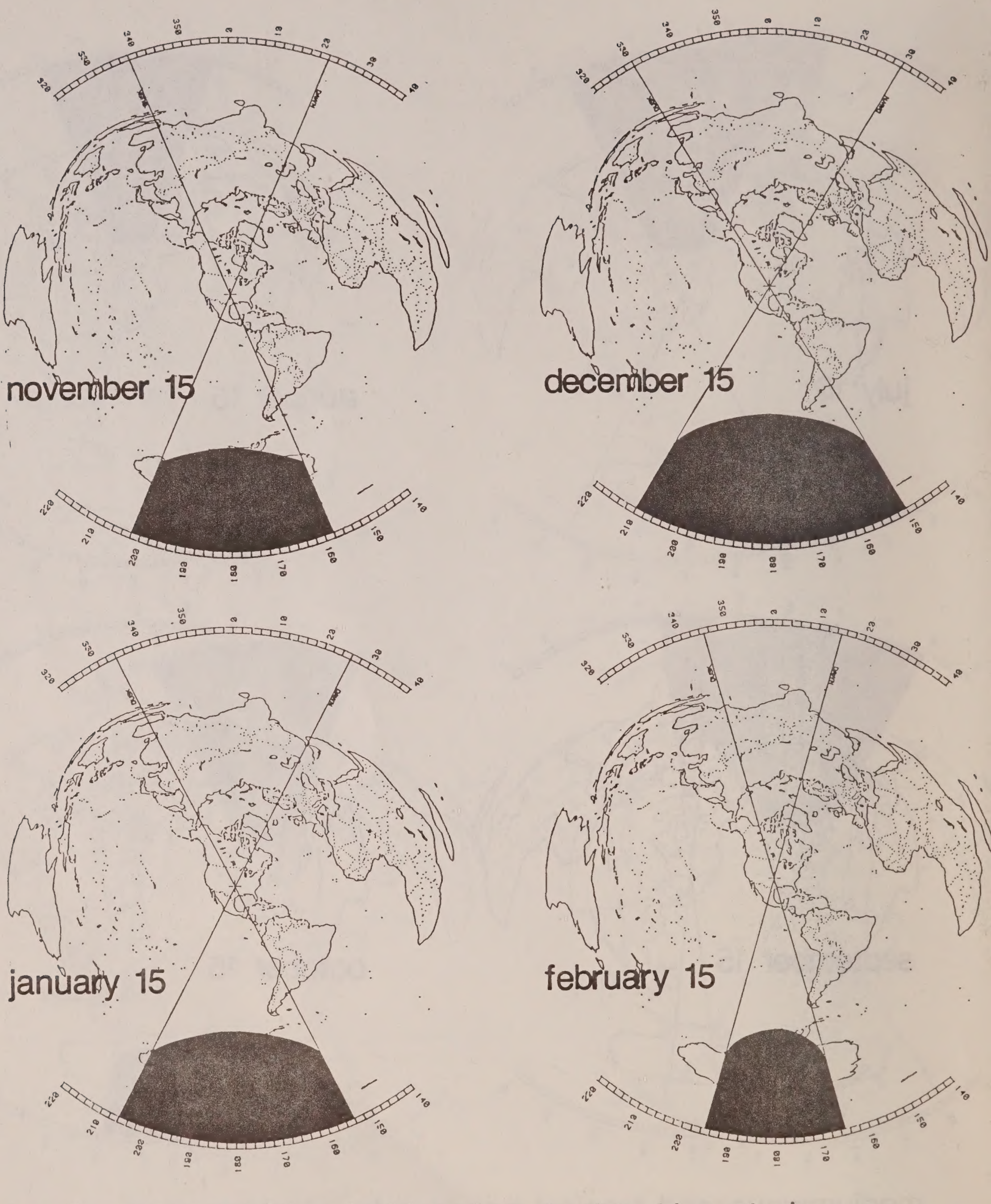
mediumwave and tropical bands solar blanking study
centered on
stillwater, oklahoma

FIGURE 7


november 15
december 15
january 15
february 15
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mediumwave and tropical bands solar blanking study

centered on

stillwater, oklahoma

FIGURE 8

What are the implications of Solar Blanking? They are fairly simple. Be conscious of what part of the globe is hidden from you by Solar Blanking and don't spend long hours trying to DX those locations at that time of the year on Medium Wave or the Tropical Bands.

You should clearly note and carefully consider an opposite/converse effect to Tropical Band Solar Blanking:

For Asian transmissions which are on frequencies which propagate best during the day (11 to 30 MegaHertz) the large amount of daylight present on our Great Circle paths during the Northern Hemisphere Summer is a real advantage. The sun practically builds a propagational ladder up the far side of the planet for high band signals headed our way during our hours of darkness. It was no accident that Kirk Allen of Ponca City, Oklahoma, finally got Radio Bangladesh on the 15 MegaHertz band in mid-May... He heard them around 0400 UTC!

The subject of terminator mechanics and its implications on DXing is a difficult one to visualize and to comprehend and equally difficult to explain. It is hoped that the tools suggested here can assist you in using this interesting aspect of our hobby to your benefit.

AUTHOR'S END NOTES

A) The assumption that SR/SS times do not change at the Equator is common in articles and books published on this subject by senior SWL's and radio amateurs. This assumption is dangerously wrong, if you are attempting to determine relatively accurate SR/SS times for graylining! The "no change" assumption is called "Mean Solar Time" and does not take into account the shift of SR/SS times caused by the "wobble" of the Earth on its own axis annually. The "wobble" phenomenon, and its effect on SR/SS times, was illustrated on most old globes by a large figure 8 pattern called the "analemma". The "wobble" phenomenon really cannot be ignored in graylining because it generates an error in calculation of SR/SS times of as much as +14 minutes (mid-February) to -16 minutes (early November).

B) The fact that long distance radio signals tend to reach us along Great Circle routes is well established experimentally and is used every day by radio amateurs with rotatable beam antennas. However, like much else in physics, this fact is not ALWAYS true. Paths of transmissions which pass near the more intense magnetic fields in the polar regions may experience bending. The transmitted wave or ray may also encounter one of the rogue "clouds" in the ionosphere and actually seem to turn to the side, causing very unusual propagation. However, as a daily experience, it is safe to say that "all" signals follow Great Circle paths.

The same caution should be applied to the idea of solar blanking. It is pretty much of a scholarly catechism to "never say never," since the physical world is distinctly non-homogenous and sometimes quite unpredictable. It may not be impossible to receive Tropical Band signals through the polar disk of perpetual light under some wildly unusual circumstances. However, again as a practical matter, solar blanking of Tropical Band and Medium Wave signals is a very predictable phenomenon.

C) The Azimuthal-Equidistance Maps, drawn on any specified QTH and reproduced about 9½" in diameter are available from Bill Johnston, N5KR, 1808 Pomona Drive, Las Cruces, NM 88001.

antennas

THE DELTA LOOP
AN ALTERNATIVE ANTENNA FOR TROPICAL BAND DXING

DAVID CLARK

Introduction

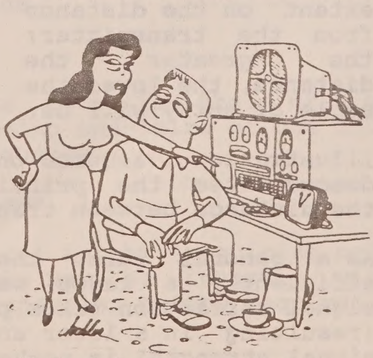
Wouldn't life be wonderful with a wide-band rotatable log periodic antenna? Unfortunately, such is well-beyond the practical and financial limitations of all but a privileged few. So, many SWL's and DXers "make do" with a simple 50-100 foot random wire. What do we do if we want a better antenna?

For the higher frequency international SWBC bands it is possible (even with relatively limited acreage) to erect one or more resonant antennas high enough to achieve greater gain and directivity. The half-wave Dipole or the inverted V are examples that come to mind. Commercially available multi-band antennas such as the Alpha Delta perform quite well and can be erected as a sloper, requiring only average backyard space. Even commercial or homebrew directive arrays can be considered. Beverages, however, are usually out of the question for lack of sufficient space.

Many serious DXers who have turned their attention to the Tropical Bands cannot find the space for a resonant wire antenna such as the half-wave dipole or a Windom, never mind a Beverage.

Furthermore, it is often quite impossible to erect the antennas high enough to take advantage of their full potential (the Beverage being the only exception this criterion). Because of this, many DXers have settled for the random wire, a compromise at best.

But as the ham radio fraternity says: "You can't work 'em if you can't hear 'em"! The best chance of hearing and perhaps QSLing the more challenging DX on the Tropical Bands comes with an effective antenna system, ideally one that is resonant, has a low noise factor and is directional. So what does one do?



"So it's only 9 p.m. in the Fiji Islands! Get out of your dugout canoe and come to bed!"

The purpose of this article is to describe a more effective alternative to the general purpose random wire for Tropical Band DXing. In many cases, this antenna can be erected (invoking some compromise in symmetry, if necessary) in space where even the half-wave dipole cannot be accommodated. The antenna in question is the Full-Wave Delta Loop (sometimes referred to as a Triangle Antenna) which strangely enough, seems to have been largely ignored and thus remains quite unfamiliar in the SWL/DX hobby.

Propagation Considerations

There are a number of considerations which recommend the Delta on the part of Tropical Band DXers. First, a review of some propagation basics in order to better appreciate its most important characteristic.

Everyone is acquainted with the traditional pictorial model which shows how shortwave signals are propagated by the ionosphere from transmitter to receiver. Single hop transmission takes place at distances up to 2500 miles (4000 km) for F2 refraction - somewhat shorter for F layer (night-time) or E layer refraction, I believe.

Beyond this distance, the angle of radiation decreases (approaches zero) and communication such as we as DXers are interested in takes place by multiple hop refraction. The angle at which a radio wave enters our listening post depends to a large extent on the distance from the transmitter; the greater the distance, the lower the angle of entry will be.

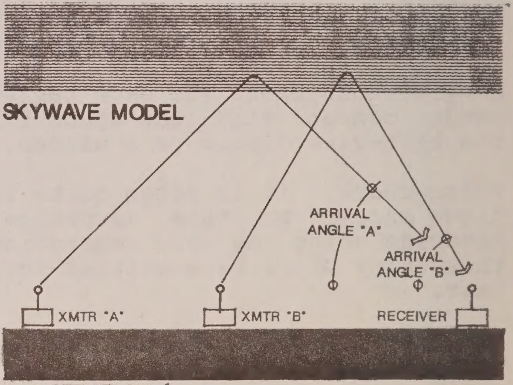


ILLUSTRATION 1

Illustration 1 assumes only a single hop but more importantly, demonstrates the principle that the angle of entry is reduced as the distance between transmitter and receiver is increased.

As a general rule, the lower the angle of entry the more efficiently a radio wave can be received. The manner in which signal refraction takes place in a grayline propagation situation (resulting in a lower angle of entry and an attendant increase in signal strength) is perhaps the best proof of this.

Characteristics of the Full-Wave Delta Loop

(a) Polarization and Wave Angle Response:

If we expect to receive the better DX signals on the Tropical Bands, it is important that our antenna be sensitive to signals coming in at low angles (say from 10 to 40 degrees above the horizon). This is especially important because most of our antennas are erected at compromise heights. Given the distance from point of origin which our target signals have travelled, they will have been refracted a number of times by the ionosphere and thus will usually arrive at our location at a low wave angle above the horizon.

The full-wave Delta Loop can be erected so that it is horizontally or vertically polarized. When vertically polarized, the Delta exhibits maximum sensitivity at low vertical angles - even when mounted at low heights. This is crucial for superior DX performance.

Furthermore, while the Delta is classified as a single element antenna, it has one leg in a horizontal position and two legs in a vertical or vertically sloping position. Because of this shape, even when configured for vertical polarization, it also exhibits moderate horizontal polarization at somewhat higher wave angles. Skywave signals arrive at the receiving antenna with both horizontally and vertically polarized components as a result of the "scattering" effect of ionospheric propagation. The Delta will respond favourably to signals which may arrive at a variety of wave angles.

In summary, the vertically polarized full-wave Delta Loop exhibits useful sensitivity at all important angles above with horizon but its maximum sensitivity at low wave angles, even when mounted near the ground, makes it an ideal, limited-space antenna for DXing purposes on the Tropical Bands frequencies.

(b) Basic Configuration:

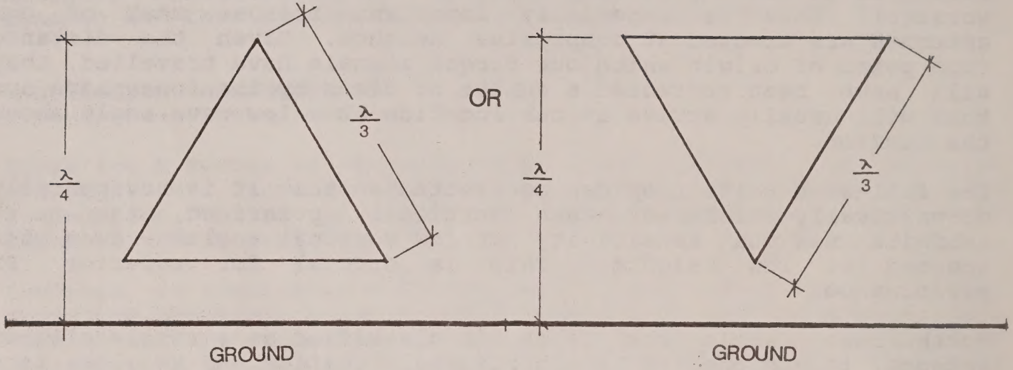
The basic configuration of the Delta Loop is that of an equilateral triangle with each side being one-third of one full wavelength for the intended resonant frequency.

[L (feet) = 1005/f (MHz)]

Notice that the apex may be at the vertical height (requiring only one high suspension point) or the triangle may be inverted with the apex at the bottom (two high suspension points required). {see illustration 2 - next page}

ILLUSTRATION 2

DELTA LOOP CONFIGURATIONS



In either case, maximum directivity is broadside to the plane of the antenna at resonance. For best low angle pickup of DX signals), vertical height should be about 1/4 wavelength above the ground.

Placement for the coaxial (or open line) feedpoint is the critical factor which determines whether the Delta will be basically horizontally or vertically polarized and this in turn governs the primary signal pickup pattern of the antenna. A number of variations will be described.

(c) Comparison to Quad Loop:

There is another form of loop too, although the focus of this article is on the Delta because it is more likely to meet the space constraints of suburban DXers. The Quad Loop is in the shape of a square instead of a triangle. Each side is 1/4 wavelength for a total length again of one wavelength at the intended resonant frequency. Its operating characteristics are essentially the same as the Delta except that the Quad affords slightly better gain than the Delta because it occupies a greater area in free space. In like manner, the Quad can be fed to provide either a horizontal (high angle sensitivity) or vertical (low angle sensitivity) polarization.

Carl Huffaker down Mexico way advises that he uses Quad loops mounted parallel to the ground in order to null the noise from overhead powerlines. He adds that this arrangement provides good omnidirectional reception with excellent response at low wave angles.

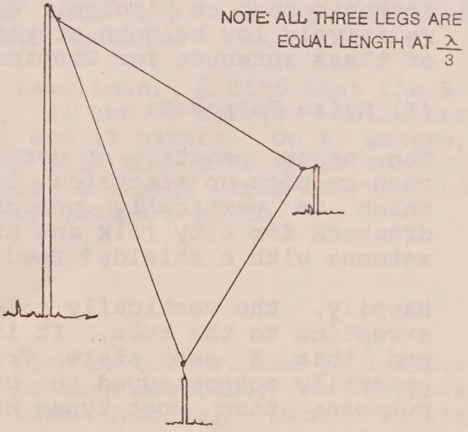
(d) Comparison to Ground Plane:

The Delta exhibits most of the positive characteristics of other vertically polarized antennas (such as the Ground Plane) but without the negatives. I believe it is useful to draw this comparision to understand the characteristics of the Delta. Verticals do not enjoy a stellar reputation in SWL circles and are seldom used by shortwave DXers, even for the higher bands.

Like the Delta, the Ground Plane with a satisfactory array of radials to achieve an efficient "image" antenna, picks up signals at a low angle and thus is effective for DX work. It is truly an omnidirectional antenna, whereas the Delta, while providing satisfactory response for all compass points, is moderately bi-directional (broadside to its plane, especially at the resonant frequency) and thus can be "pointed" to favour an intended target area. For example, in Ontario, a Delta erected in a NE-SW orientation would favour signals arriving on great circle paths from Southeast Asia (NW) and Southern Africa (SE).

The Ground Plane actually works best when mounted close to the ground. The Delta functions well when erected at low heights. Although a height of 1/4 wavelength above ground is considered desirable, this is probably impractical, especially when a Delta cut for resonance on 120 or 90 meters. Two solutions are at hand (see illustrations 3 and 4) which do not seriously detract from its overall performance in terms of directivity or low wave angle response, as far as I know.

On the one hand, where it is not possible to get the Delta 1/4 wavelength above the ground and keep the vertical legs are at 90 degrees to the ground, the legs may be sloped away from the high point at a convenient angle of say 45 degrees. Make sure that the lowest point remains reasonably above the ground (10 feet would be a good objective, if possible). Best efficiency is assured by maintaining the equilateral shape.

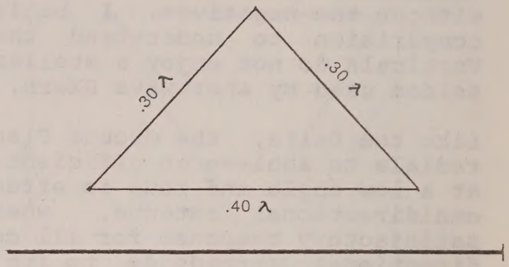

NOTE: ALL THREE LEGS ARE EQUAL LENGTH AT $\frac{\lambda}{3}$

BASIC DELTA LOOP CONFIGURATION
ILLUSTRATION 3

Alternatively, it is acceptable to save on vertical height by distorting the equilateral triangle by moderately shortening the two vertical sides (in equal amounts), thus creating a proportionately longer horizontal side. In this case, however, you should make sure that the longer leg does not exceed more than .4 of a wavelength, thereby leaving .3 wavelength for each of the other two sides. This configuration also has some affect on the impedance but more on that later.

ILLUSTRATION 4

HORIZONTAL LEG IS .40 λ
TWO SLOPED LEGS ARE
EQUAL LENGTH AT .30 λ



ALTERNATE LOOP PROPORTIONS

(e) Comparison to Horizontal Antennas:

Turning to horizontal antennas for a moment, everyone is familiar with the general advice that they should be mounted in the clear and as high as possible. Actually, the horizontal half-wave dipole must be mounted at least 1/2 wavelength above the ground to achieve any semblance of sensitivity towards signals arriving at low angles. This would amount to ridiculous heights in the hundreds of feet for 120 and 90 meters! Thus, in this respect the Delta Loop significantly outperforms horizontally polarized antennas such as Dipoles, Windoms and the random wire, given the relatively low heights at which it would be practical to mount any of these antennas for Tropical Bands work.

(f) Noise Response:

The major negative of vertically polarized antennas is that they tend to pick up electrical interference and RF static - most of which is vertically polarized. This can be a rather serious drawback for city folk and might otherwise dictate a horizontal antenna with a shielded feedline.

Happily, the vertically polarized Delta Loop is most assuredly an exception to the rule. It is actually a very low noise antenna and this I can state from practical experience! The Delta is generally acknowledged to be very much quieter for receiving purposes than most types of verticals and indeed some horizontal antennas. This is typical of a closed loop. (At my location, only the Beverages (unterminated) with a length of 600-800 feet seem to be consistently quieter.) I have yet to find a technical explanation of why this is so; perhaps the interaction of the horizontal and vertical elements serves to cancel out or reduce pickup of vertically polarized interference that would be more noticable with other forms of vertically polarized antennas.

(g) Other Performance Characteristics:

The Delta enjoys a modest gain advantage over the half-wave dipole (about 1.5 to 2 dB) and even more so over a Ground Plane, Windom, Inverted V or a simple random wire. Naturally, other forms of highly directive antennas such as three or four element Yagi or Quad beams afford vastly greater gain than the Delta but how many 60 or 90 meter beams have you seen lately?

While I have no hard data to back this up, various texts indicate the Delta is reasonably broadbanded. With proper impedance matching, I wouldn't be surprised if an SWR of 2:1 or less were to be exhibited for up to 150-200 kHz away from resonant frequency. Of course, this criterion is really only important to the amateur operator for transmitting purposes. As far as I'm concerned for receiving purposes, a 60 meter Delta cut to 4800 or 4900 kHz performs admirably for DXing anywhere from say 4500 to 5200 kHz, especially in the two favoured directions - broadside to the plane of the antenna.

The Delta will also perform reasonably well and seems to be more omnidirectional on frequencies other than those for which it is cut. According to the textbooks, better multi-band performance can be realized by using a higher impedance open-wire (balanced) feedline (instead of unbalanced 52 ohm coax) together with an antenna tuner to match to the input impedance of the receiver. I have no personal experience to date with the use of balanced feedlines on which to base any further comment.

In my own case, even using coaxial feedlines, I find that the 90 meter Delta works well on all of 31, 41 and 19 meters, while the 60 meter version is quite good on 41 and 25 meters. On 60 meters, the 120 meter Delta provides a lower gain than a 60 meter version (both are oriented to favour signals arriving from North and South) but nonetheless a distinctively good S/N ratio.

Radiation Patterns

How might a one-wavelength Delta Loop be constructed to achieve that all-important low angle pickup pattern desirable to improve the chance of logging those weak Tropical Band Indo's?

For a given configuration, placement of the coaxial feedline determines whether the antenna will be horizontally or vertically polarized. Only when the antenna is high enough up in the air - at least 1/2 wavelength of the resonant frequency - does polarization become less of a consideration. This is hardly possible, however, for the Tropical Bands. And so, one should opt for vertical polarization which will provide the desired maximum sensitivity to the low wave angle signals.

First let's examine two of the possible configurations of the full-wave equilateral Delta which will result in horizontal polarization. With the apex up, in one case the feedline is placed at the apex; in the other case, the feedline is at the mid-point of the base (see illustration 5).

Notice that maximum sensitivity is at undesirably high wave angles (close to 90 degrees) similar to both the Inverted-V and horizontal half-wave Dipole mounted at a corresponding height of 1/4 wavelength (see illustration 6). In all cases, there is only limited sensitivity to DX signals arriving at angles of 40 degrees or less above the horizon.

HORIZONTAL POLARIZATION

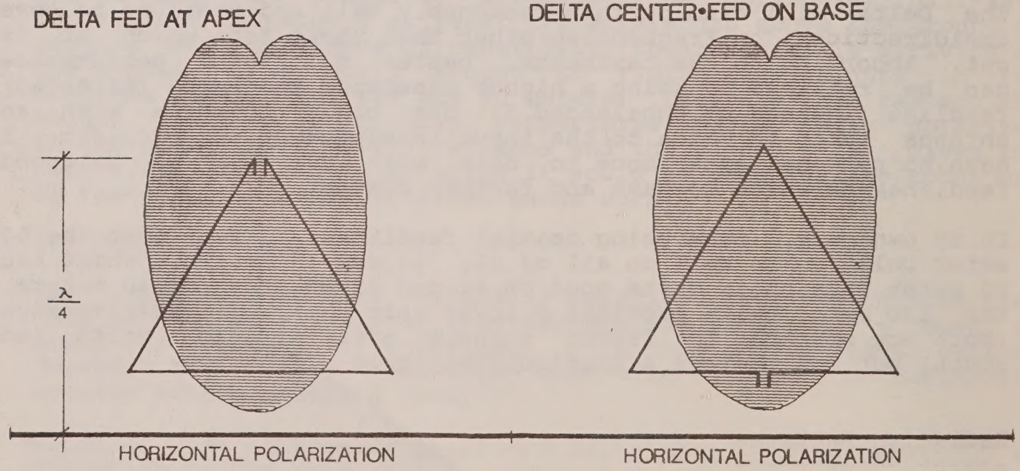


ILLUSTRATION 5

HORIZONTAL POLARIZATION

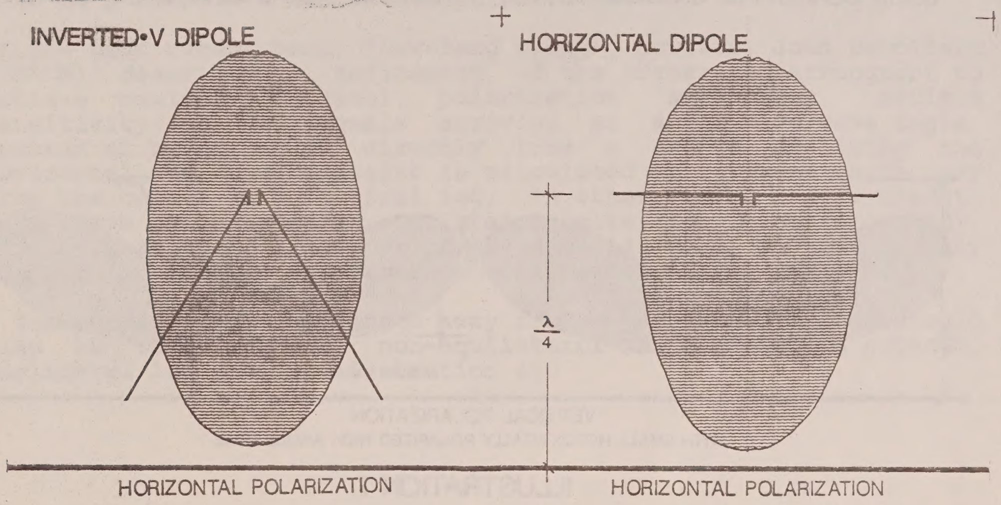


ILLUSTRATION 6

Compare the two examples of horizontal polarization in illustration 5 to the following three situations where the Delta is fed to emphasize vertical polarization. If the antenna is fed at a corner, the apex may be up or inverted (see illustration 7). It may also be fed at the point of an inverted apex (see illustration 8).

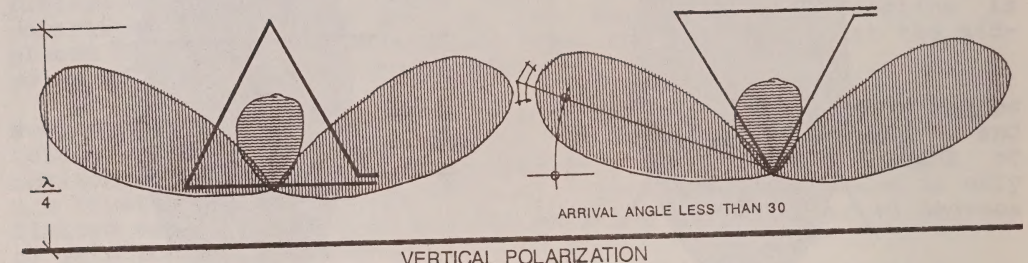
When corner fed, the vertical radiation lobe angle (sensitivity pattern for receiving) is reduced to 25 degrees or less. When fed at an inverted apex, the angle is about 30 degrees (quite similar to an ordinary Vertical - see illustration 9).

Any vertically polarized arrangement is is much more satisfactory for Tropical Bands DXing where typical wave angles are in the range of 10 to 40 degrees above the horizon as we receive the signals. The key advantage with the Delta lies in obtaining this response at a relatively low antenna height.

VERTICAL POLARIZATION

DELTA CORNER•FED ON BASE

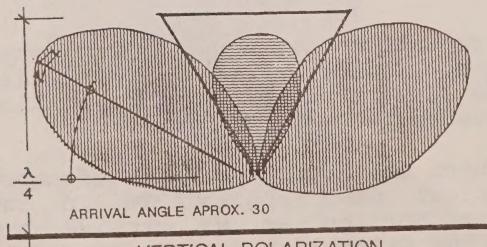
INVERTED DELTA FED AT UPPER CORNER


$\frac{\lambda}{4}$
ARRIVAL ANGLE LESS THAN 30

VERTICAL POLARIZATION
WITH SMALL HORIZONTALLY POLARIZED HIGH ANGLE LOBE

ILLUSTRATION 7

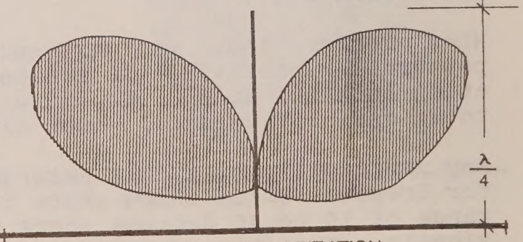
INVERTED DELTA FED AT APEX


$\frac{\lambda}{4}$
ARRIVAL ANGLE APROX. 30

VERTICAL POLARIZATION
WITH HORIZONTALLY POLARIZED HIGH ANGLE LOBE

ILLUSTRATION 8

1/4 WAVE VERTICAL


$\frac{\lambda}{4}$

VERTICAL POLARIZATION

ILLUSTRATION 9

Conventional wisdom holds that the inverted corner-fed Delta (illustration 6) is the optimum configuration to emphasize low angle sensitivity. Of course, apex up and corner-fed at the horizontal base would probably be easier to mount for most users with no perceptible difference in performance.

In his most recent book, 'Low-Band DXing', however, John Devoldere (ON4UN) describes a refinement of the corner fed arrangment to achieve maximum vertical polarization and thus, maximum sensitivity to DX signals arriving at a very low wave angle. Instead of being taken directly from a corner adjoining the horizontal leg, the feedpoint is calculated as .08 wavelength away from the corner on a vertical leg, in other words, 1/4 wavelength away from the apex of an equilateral Delta (see illustration 10). Apex up (easier to erect) or inverted would seem to be equally acceptable from a performance viewpoint.

A feedpoint of .08 wavelength away from a horizontal corner should also be used for the non-equilateral Delta having an extended horizontal leg (as in illustration 4).

VERTICAL POLARIZATION WITH OPTIMAL FEED POINT FOR DX WORK

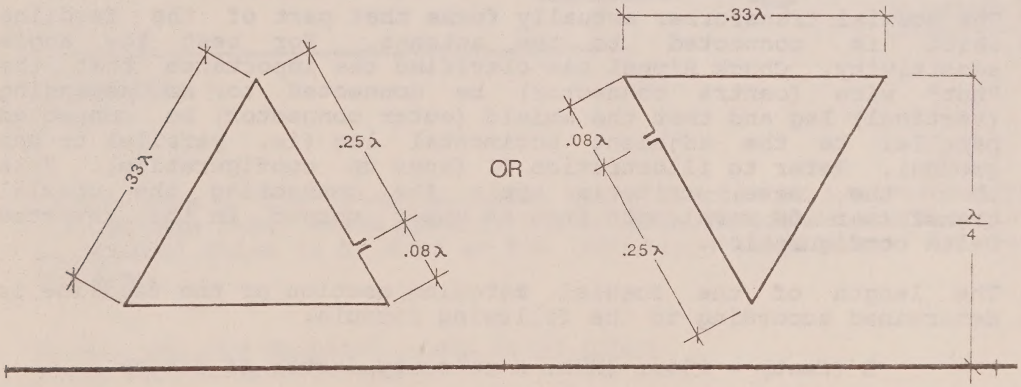


ILLUSTRATION 10

Impedance Matching

I have made reference to the possible use of a balanced open wire feedline (such as 300 ohm unshielded TV twin lead or 450 ohm open ladder line), together with a suitable antenna tuner (such as a Transmatch), to improve multi-band performance. This would be a "natural" in the sense that the Delta loop is a balanced antenna.

A disadvantage of unshielded feedline, however, is that it is more susceptible to noise-pickup. This might be of concern to the majority of readers. Furthermore, since our focus is on the use of the Delta cut for a particular Tropical Band, I have assumed that multi-band performance is of lessor concern. For these reasons, we shall concentrate on using a feedline consisting of unbalanced coaxial cable.

The characteristic impedance of the equilateral full-wave Delta (erected at 1/4 wavelength) is between 100 and 150 ohms at feedpoint. Use of a quarter-wave 75 ohm transformer is thus recommended. The appropriate length of RG-11A/U or RG-59A/U coax (the latter is much cheaper) will suffice for this purpose. An excellent match to the standard low impedance RG-8/U or RG-58A/U coaxial line is thus achieved. This low impedance line (length is not critical) is then connected directly to the low impedance antenna input of your receiver.

The coaxial transformer actually forms that part of the feedline which is connected to the antenna. For best low angle sensitivity, Chuck Rippel has clarified the importance that the "hot" wire (centre connector) be connected to an ascending (vertical) leg and that the shield (outer connector) be connected parallel to the adjacent horizontal leg (ie. parallel to the ground). Refer to illustration 11 (apex up configuration). Note that the same criteria apply for connecting the coaxial transformer .08 wavelength from an upper corner in the inverted Delta configuration.

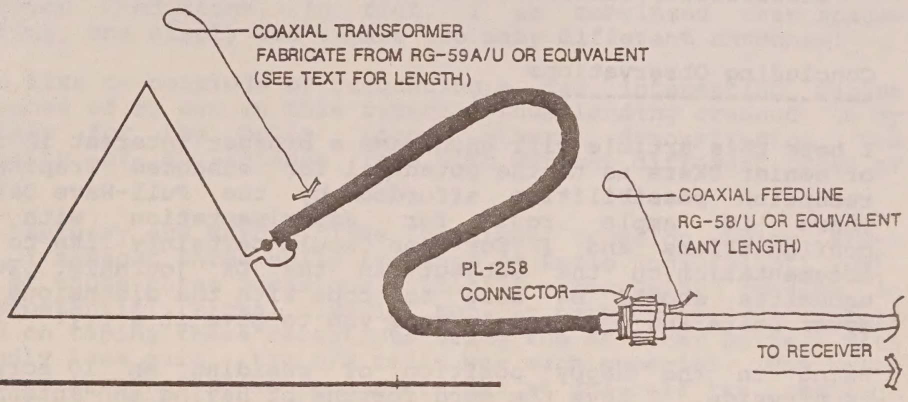
The length of the coaxial matching section of the feedline is determined according to the following formula:

L (feet) = 234/f (MHz) X velocity factor of feeder

The rated velocity factor (which associates the physical length with the electrical length of a particular feedline) is .66 for for both the RG-11 and RG-59 lines. Thus, for example, using 3.300 MHz as the point of resonance, a 90 meter delta would require a coaxial feed line of 234 / 3.3 X .66 = 46.8 feet. Refer to the table following.

Splice the other end of the coaxial transformer to the RG-8 line leading to the receiver using a PL-258 coupler and seal if this connection point is outdoors.

As height above the ground is reduced (below 1/4 wavelength), the antenna impedance at feedpoint of the equilateral Delta becomes somewhat lower but I believe the matching transformer is still desirable.


COAXIAL TRANSFORMER FABRICATION

COAXIAL TRANSFORMER
FABRICATE FROM RG-59A/U OR EQUIVALENT
(SEE TEXT FOR LENGTH)
COAXIAL FEEDLINE
RG-58/U OR EQUIVALENT
(ANY LENGTH)
PL-258
CONNECTOR
TO RECEIVER

ILLUSTRATION 11

In the case of the non-equilateral Delta erected at 1/4 wavelength (or perhaps less) above ground, the antenna impedance at feedpoint is already close to 50 ohms so the matching transformer is not required.

Dimensions for Tropical Bands Delta Loops

The table on the page following shows appropriate lengths for each of the three legs (ie. L1 = L2 = L3) and the coaxial transformer (L4) for an equilateral Full-Wave Delta cut for about centre frequency for each of the respective Tropical Bands. Lengths are specified in feet.

Band / Freq (MHz)		L1	L4
120	2.400	139.6	64.3
90	3.300	101.5	46.8
75	3.950	84.8	39.1
60	4.900	68.3	31.5

Concluding Observations

I hope this article will encourage a broader interest in the minds of senior DXers as to the potential for enhanced Tropical Bands reception possibilities afforded by the Full-Wave Delta Loop. There is ample room for experimentation with various configurations and I for one would certainly like to see more documentation on the subject in the DX journals. Even most urbanites should be able to cope with the dimensions for a 60 meter Delta and I sincerely urge you to give it a try!

Being in the happy position of residing on 10 acres in the countryside, I have the good fortune of having an "antenna farm" consisting of a number of Delta Loops and Dipoles (all of which are cut for the Tropical Bands), as well as several Beverages so at least I can cite some practical experience as a guide to others.

I presently have four Full-Wave (equilateral) Delta's in place on the property, all of which were erected before I became acquainted with the relative advantages of vertical and horizontal polarization. As it happens, the 120 and 60 meter antennas (apex down) are fed to provide vertical polarization but without the coaxial transformer. The two 90 meter antennas (apex up) are fed to provide horizontal polarization with a coaxial transformer.

There is no discernable difference in noise sensitivity although the comparisons cannot be considered too conclusive as they are cut for different frequencies. I might add that in all cases, my Delta's are erected such that the vertical legs slope away from the vertical height at about a 45 degree angle. Furthermore, they all fall closer to ground level than they really should and yet, I am very enthusiastic about their performance.

It is not advisable to erect two Delta's running at right angles to each other from a common support. This causes mutual coupling (ie. a loss of isolation) which will skew their performance characteristics. In my case, the 120 and 60 meter Delta's are erected more-or-less concentrically. They are well-separated from the two 90 meter Delta's which, however, are also erected almost concentrically. I have no data to evaluate what affect, if any, results from the proximity of two Delta's in a concentric configuration. If possible, I imagine total isolation of each antenna would be the best policy.

While the Delta's generally provide the most consistent results on the bands for which they are cut, it is difficult to predict which antenna, be it a Delta or otherwise, will be the "right" antenna in certain circumstances - especially during periods of unusual propagation conditions. In fact, I am convinced that space-permitting, one simply can't have too many different antennas!

I would like to conclude by recounting a few interesting recent experiences of my own in this regard, some lending credence to my enthusiasm for the Delta Loop, others demonstrating the versatility of an antenna farm with various different types of aerials.

During February and March, 1988 (the last occasion being March 23rd), I managed three solid loggings of Radio Enga (2410.1 kHz). On two of those three occasions, the 120 meter Delta brought in very substantial signal levels but in both cases I ultimately settled on taping these receptions using the 60 meter Delta. With admittedly less gain, the S/N ratio was much superior. The Delta isn't even supposed to be good performer at one-half the resonant frequency to which it is cut.

On the same March 23rd morning, the PNG opening extended to Irian Jaya but not much further to the west. Between 1115 & 1130, RRI, Manokwari (3986.2), an infrequent visitor here, was noted at "best ever" levels. Best antenna: 90 meter Delta pointed at PNG. Later, at 1200, RRI, FakFak (4790.3) was 2nd best Indo on the 60 meter band (competing with Ujung Pandang for top honors). In this case - best antenna was the 60 meter dipole. The real news, however, was my first-time logging of RRI, Nabire on 5055.4 (a rare catch, at least in eastern North America). It was parallel with the Jakarta news relay to 1214, then into local program. Best antenna: that 60 meter Delta again (only slightly weaker but with much less noise than the dipole which was doing a good job with FakFak).

On April 4th, 1988, at the height of a major geomagnetic storm, Radio Television Hong Kong on 3940 kHz was logged from 1125-1142 s/off with extraordinarly strong signals over-riding the co-channel Chinese regional which was also audible. Of the eleven available choices, a 90 meter dipole, oriented N-S (and thus directive E-W) was clearly the superior antenna. Considering that my great circle path to Hong Kong lies at about 350 degrees West of North (ie. directly over the region of the North Magnetic Pole), this seemed to be a classic case of "Donut-Hole" reception...but why that antenna? Perhaps the path of least resistance for the signal was not the great circle path after all but rather a crooked path.

To continue the April 4th saga, my local sunrise on this date is just prior to 1100. After the excitement associated with the South China Sea Yacht Race weather broadcast had died down a little, I continued checking S.E. Asian channels on the 60 meter band past 1200. To my surprise, many channels were still showing fair audio over the ever-increasing band noise using my two "best" antennas (a 60 meter dipole oriented for maximum directivity over the magnetic pole into Java; the other a 60 meter Delta running E-W to also favour reception from "over the top".

Checking WWV at 1218, I learned that the 1200 K index was = 6! This is an unually high number, indicating that a major geomagnetic storm is in progress. As 1230 approached, the signals were pretty much lost to band noise until I happened to switch to the 120 meter Delta (also running E-W to favour N-S broadside reception). Low and behold, the noise level was cut to a fraction of its former self and numerous of the Indo's and Chinese regionals were again clearly readable, albeit at relatively weak levels. RRI, Jakarta (4774.8) held up sufficiently well such that I taped their SCI at 1258, precisely two hours after sunrise! Strike up one for a two-wavelength Delta.

Finally, an observation regarding some of the lower-frequency Sumatra outlets which are sometimes audible during the afternoon window available to DXers in the eastern part of the continent. From November until mid-March, 1988, starting just prior to 2200 (subject of course to sign-on times) and extending to as late as 2330, a number of RRI outlets were heard on more than one occasion peaking to amazingly solid audio levels. These included: Bukittinggi (3231.8), Bengkulu (3264.7), Tanjungkarang (3395.2) and Padang (4002.7). A 600 foot (unterminated) Beverage of about two wavelengths, appropriately pointed N-W vis-a-vis their great circle positioning for me, was always the best antenna bar none - very quiet too. If you have the space, obviously the Beverage has its place! One of these fine days, I'm going to get a 90 meter Delta in the air which is oriented in the same direction. I suspect this would make for some very interesting comparisons.

For the record, my primary receiver is the NRD-515 (look for a user review elsewhere in Proceedings from Kirk Allen and myself) which has certainly stood me in good stead. At the same time, I sincerely feel that the preceding experiences, some of which were quite thrilling to me, clearly vindicate my belief that every Tropical Band DXer should seriously consider the merits of the Full-Wave (vertically polarized) Delta Loop.

There's still time before the 1988-89 season begins in earnest - DO IT!!

References

D. DeMaw and L. Aurick, "The Full-Wave Delta Loop at Low Height", QST, October 1984

Edward M. Noll, Antenna Handbook

John Devoldere, Low-Band DXing

John Devoldere, 80 Meter DXing

W. Orr and S. Cowan, The Radio Amateur Antenna Handbook

A FERRITE ROD SHORTWAVE ANTENNA

CHUCK BOLLAND

Recently I obtained an old radio direction finding unit at a hamfest. It was inoperative and beyond repair but costing only two dollars, I wasn't disappointed. I was mainly interested in the antenna system in the unit because of the frequency range of the unit; from the low band through the 49 meter shortwave band. The antenna was located on top of the radio beneath a rotating dome shaped cover.

Finding that the radio did not work, I took it apart. As I have imagined, there was a ferrite rod wrapped with turns of wire under the dome. I removed the rod without disturbing the windings. I began testing this ferrite rod in various locations of my shack to see if it could be used as an indoor antenna. Since there are many violent thunder storms here in Florida, I wanted a small indoor antenna that was sensitive and safe enough to be used during storms. Unfortunately, because of the metal construction of the house, this was not the answer. The antenna's pickup was hindered by the metal in the walls. Failing in that experiment, I tried the antenna outside and found it to be almost beyond belief. The gain from the ferrite rod was as good as my dipole and longwire antennas, especially on the 49 meter and 60 meter shortwave bands. I continued to use this ferrite rod until it was blown down one day by a high wind consequently breaking into a number of pieces.

Ferrite rods come in many sizes and chemical compositions. These differences influence the rod's frequency response, Q and heat tolerance. Depending on the manufactures, the rods are coded differently so that the information about the ferrite rod or core will be known. The rod may be a certain color or have colored dots on each end. These codes seem to vary among different manufactures.

Ofcourse, not knowing what the color codes meant on the rod from the experimental ferrite rod antenna, it was necessary to purchase a ferrite rod from Amidon Associates which corresponded to the frequency bands that I wanted to receive.

The stock number of the ferrite rod I purchased and the source were: Part number R-61-050-750

Amidon Associates, 12033 Otsego Street, North Hollywood,
California, 91607

Call for prices:(818) 760-4429

Ferrite rods are available in several different ferrite materials, but the most common stock items are of the #33 and the #61 materials. Both types of rods are mainly used for antenna construction and choke applications.

The #61 material rods are widely used for antennas covering the commercial AM radio band and on up to 10MHz. The #33 material rods are more suitable for the lower frequencies and the VLF range.

Upon receiving the ferrite rod from Amidon, I duplicated the turns of wire from the broken experimental prototype rod. After placing the rod on a pole and attaching it to a feed line, I was surprised to find that it also performed as well as my dipole antenna.

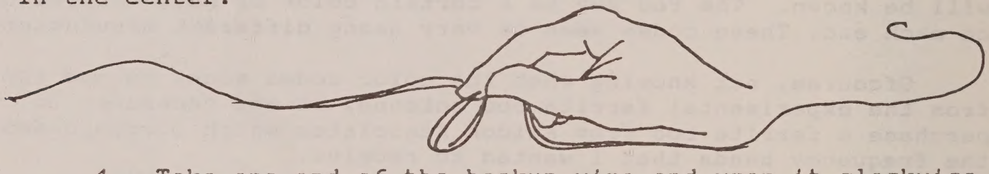
The constant complaint from apartment dwellers that they do not have adequate space to erect a longwire or dipole can be solved with an antenna made from a ferrite rod. If they are unable to go up to the roof of their dwelling with this antenna and special easily constructed protection, they can throw the antenna to the roof as long as the feed line is strong enough to take the strain. Be sure, however, that the antenna or feed line does not come in contact with electrical power lines or other sources of danger.

How do you construct the ferrite rod antenna? After the rod has been purchased, it is a simple process of construction.

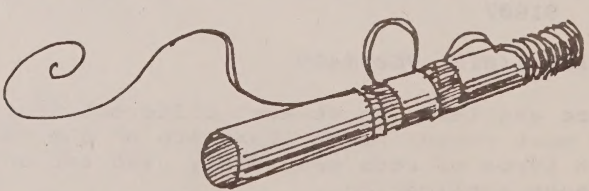
1. First wrap the rod with a layer of electrical tape. This will give the rod added strength. Ferrite rods are easily broken so they should be handled with care.

2. Cut three yards or hookup wire for the windings. The wire should be about 20 gauge. Litz wire can also be used but experiments with this type of wire have proved less satisfactory than ordinary insulated hookup wire.

3. Fold the hookup wire in two to determine the center and make a small loop of the wire in your hand. The diameter for the loop should be around one inch. Tape the loop onto the ferrite rod in the center.

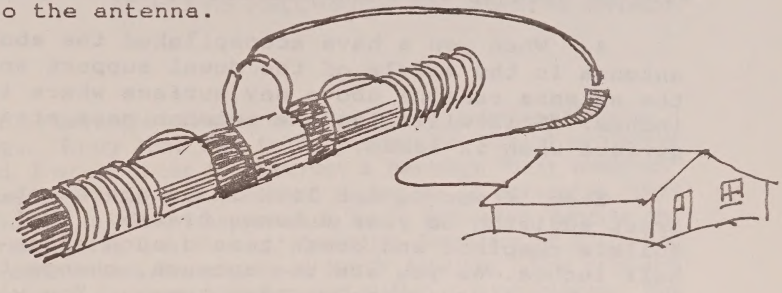


4. Take one end of the hookup wire and wrap it clockwise on the ferrite rod. Start to wrap the wire about an inch and a half from the right hand end of the rod. Wrap twenty five tight turns trying to get the last turn as near to the end of the rod as possible. Tape the turns in place with electrical tape.



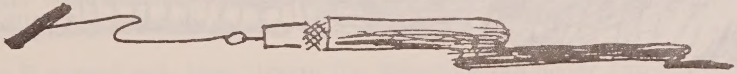
5. Now take the other end of the hookup wire and wrap twenty five tight turns counter clockwise on the left hand end of the ferrite rod in the same fashion as step four above. Tape the turns in place with electrical tape.

6. There should now be twenty five turns of wire on each end of the ferrite rod with a small loop of wire in the middle of the rod. Take some of the insulation from the wire where the loop is without breaking the actual wire. This will be the point where the feedline is connect to the antenna.

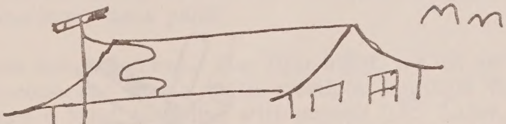


7. The feed line consists of two types of wire. The first type is the same hookup wire used to wrap the turns on the rod, if that is what was used. Take five feed of this hookup wire and solder one end to the loop on the ferrite rod.

8. The other type of wire for the feedline will be coaxial cable`s center conductor. Connect the five foot hookup wire portion of the feed line to the center conductor of you coaxial feed line into your shack. The shielding of the coaxial cable should not be connected to anything at the antenna's end. Whether or not you ground it at the receiver's end depends on the reception. I have found that just connecting the center conductor produces better results than connecting the shielding to ground too.



The antenna does not need to be very high for good reception. I have mine at around fifteen feet up from the ground. Ofcourse, there should not be any obstructions blocking reception especially things made from metal.



For those who want to try and throw the antenna up on a flat roof, remember that this can be dangerous if there is any possibility of coming in contact with an electrical source. Watch out for breaking some ones window too. Changes are that when doing this, the rod may get broken. If it is not too bad, glue it together again with "Super Glue". After all ferrite rods are just iron particles glue together.

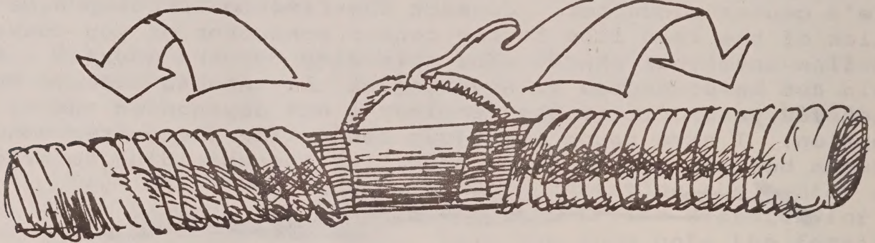
1. Reinforce the ferrite rod antenna with more electrical tape. You may wish to insert the rod in a piece of PVC pipe and cushion it with cotton before you throw it?

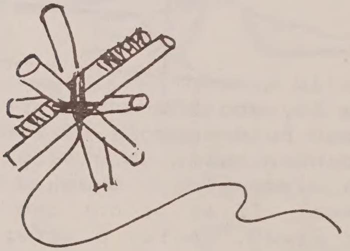
2. Making supports for the antenna so that when it lands on the roof it will be above the surface a few inches, requires purchasing a couple of half inch wooden dowels.

3. Cut the dowels into six equal lengths. Tape the dowels together in a fashion so that which ever way they fall, the center will be held up from any surface by a few inches.

4. When you a have accomplished the above step, tape the antenna in the middle of the dowel support and test it to see if the antenna remains above any surface where it lands by a few inches. This will give the antenna some area away from the roof surface when in lands.

Even if you do not live in an apartment, this antenna is a great addition to your antenna system. Its' cost is under ten dollars complete and doesn't need much space - only seven and a half inches. As you sue the antenna, change the amount of turns of wire. Try fewer turns or more turns. You will find that this also changes the frequency response to some degree. Better results can be obtained if a good amplified preselector or tuner is used with this antenna. Your experience with and construction of this antenna should lead you down a road of discovery only if you accept the challenge. Good listening.





IMPEDANCE MATCHING A BEVERAGE ANTENNA TO A RECEIVER

NICHOLAS HALL•PATCH AND JOHN H. BRYANT

BRYANT:

Ever since I first read of Beverage antennas and their almost magical attributes, I have lusted after a Beverage. Every time that failing propagation caused an illusive catch to disappear unlogged, I would swear to construct a Beverage "next weekend." Although I read every technical article ever published in English on Beverages, "next weekend" never arrived. Finally, in 1986, I happened to be in Edmonton, Alberta and arranged to spend an afternoon with Don Moman, Executive Secretary of CIDX and certainly one of the more experienced Beveragers in North America. Don patiently answered my numerous "practical" Beverage question and stiffened my backbone. The winter of 1986-87 was spent planning a DXpedition with fellow FTers Allen and Sams and in acquiring 2000' of wire plus assorted accessories. In the early spring of 1987, the expedition was ON! We planned to go about 30 miles out on the true prairie in western Oklahoma....at least 5 miles from the nearest man-made electricity, and give the thing a weekend trial. Calmer heads suggested that we string the Beverage up first at my semi-rural home to "make sure that we had all the kinks out" before going out 15 miles past the last flush toilet to stay for the weekend. We decided to test everything, including running the business end of the Beverage to my van and operating our radios on 12 volts.

The trial date arrived; after two hours of huffing and puffing, the Beverage was up and the moment had arrived to introduce the end of the wire to the back of my NRD-525! The NRD folks were even nice enough to provide two antenna ports, one for coax and one for wire antennas. As I hooked it up, I noticed the wire antenna port was labeled "High Z" (!!???).

As it turned out, even though the Beverage ran under two power lines (at about right angles), the directional and other special characteristics of the antenna allowed it to ignore all that potential noise; it proved to be an almost totally quiet antenna. Very quickly, we decided not to leave the flush toilets, refrigerator or the water bed behind to DX in a cow pasture. We had the DXpedition in my back yard!

The Beverage was everything I'd been led to believe. Our first night, we hit very fortunate propagation and logged both Europe and Japan (with multiple loggings) ON MEDIUM WAVE. Further, every band below 4 MHz was alive with superb DX! Later, I learned that if we'd been less greedy and only put up 1200', the Beverage would have worked for us up to at least 5.5 mHz! Well, when the DXpedition was over, I was not about to go back to my 'old' antennas and give up that Beverage. THAT'S WHEN THE WORDS ON THE BACK OF THE NRD "HIGH - Z" HIT ME BETWEEN THE EYES. All the reading came flooding back... "Z" means "impedance" and Beverages have characteristic impedances of from 300 to 700 ohms. The unfortunate part was that the nearest point to the shack that I could bring the Beverage — in a straight line — was over 70' from the shack. If I ran a bare wire lead-in (at about 90, to the Beverage) to the Shack, the directional characteristics of the Beverage would be badly compromised. If I ran a 400-700 ohm antenna through 50 ohm coax, I didn't know what would happen, but the words IMPEDANCE MISMATCH kept running through my mind. On the other hand, converting one of the two family cars into a semi-permanent DX shack in the backyard was causing major QRN at the dinner table... What to do?? What to do??

I called several technically proficient friends and they said - "No sweat, the Beverage has plenty of gain — use coax, come in out of the truck, its OK!" I tried that and it was nice to be inside, but now the Beverage seemed to perform as "just another wire antenna", particularly on weak signals. I was sure that I was suffering significant losses due to poor matching. I knew that Beverages were one of the most popular antennas for medium wave DXers and I knew that Nick Hall-Patch, Technical Editor for the medium wave Club IRCA, was technically astute and that he was a shameless Beverager. I contacted Nick and he solved the mismatch problem in a flash...thereby saving the Beverage and probably the marriage. He performed this miracle by introducing me to matching transformers constructed using toroidal shapes made from ferrite (sorta like iron Life Savers).

Looking back over this whole experience I realized that I DID NOT REALLY KNOW WHAT IMPEDANCE WAS!, even though I'd been in and around this hobby for over 35 years. Further, I realized that other DXers might well make the mistake which I did: running a high Z antenna through 50 ohm coax and thus loosing a substantial amount of gain. So, I imposed upon Nick once again and asked him to write up what we had done and to begin his article with an explanation of Impedance that even I could understand. I'm pleased to say that he has done so. Nick take it away.......

HALL-PATCH:
IMPEDANCE

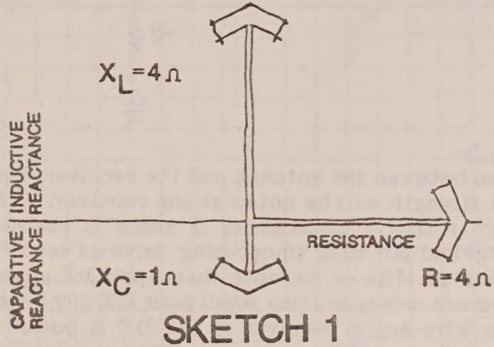
"Impedance" is one of those mysterious electronic terms which I'll attempt to define before we proceed to the body of this discussion. The term "impedance" is obviously derived from the verb "to impede" and impedance is a quality which impedes the flow of electric current. A more common and accessible term is "resistance' which is also a quality which impedes the flow of electric current, and in doing so converts electrical energy into another form of energy (heat, mechanical or whatever). Resistance has a similar effect on electric current whether the current is AC or DC.

However, when we are speaking of AC, more than simple resistance can impede the flow of electric current. An AC electric motor often has negligible DC resistance — a couple of ohms. If resistance of such a motor winding was all that impeded the flow of current, by Ohm's Law (I=E/R), it would pass a current of 30 or 40 amps. But it doesn't. It can be more like one or two amps. The inductance of the motor's winding also impedes the passage of AC by a quality known as inductive reactance (this reactance will also initially impede direct current (DC) but we won't go into that).

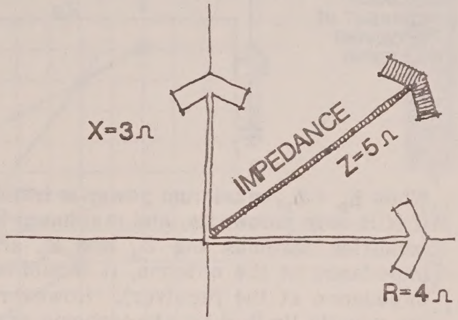
Inductive reactance is also measured in ohms like resistance is, but is dependant on the frequency of the applied AC: $X_L = 2\ fL$ where X_L is inductive reactance, f is frequency in Hertz, and L in inductance in henries. Virtually no current would flow in our electric motor if RF type AC were applied to it, as its reactance would be so high. Inductive reactance impedes the flow of current, but it does not convert electrical energy to other forms of energy as resistance does; it simply stores the energy.

Another form of reactance is capacitive reactance, which is also measured in ohms and is frequency dependant: $X_C = \frac{1}{2\pi f C}$ where X_C is capacitive reactance in ohms, f is frequency in Hertz, and C is capacitance in Farads, but in this case, increasing the frequency of applied AC lowers capacitive reactance. X_C is usually denoted as a negative value, because capacitive reactance can cancel out inductive reactance when they're in series; this is the basis of tuned circuits. Capacitive reactance also impedes current flow, but stores electric energy rather than dissipating it in non-electrical energy.

So what is impedance then? It is the combination of capacitive and inductive reactance along with simple resistance in a circuit. Although these three qualities are all measured in ohms, they are not the same thing, and cannot simply be added together. Their common quality is that they impede the flow of alternating current, including AC at radio frequencies. Capacitive and inductive reactance can be added together in a series circuit, but the resulting value in ohms can't be then directly added to the resistance value in ohms. We must move into two dimensions to perform this addition, and refer to Sketch 1.



SKETCH 1



SKETCH 2

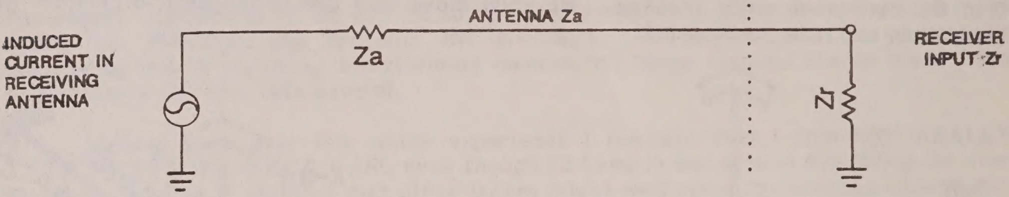
Resistance is a positive value on the x-axis of our two dimensional graph, X_L is on the positive y-axis, which X_C is on the negative y-axis. If X_C is 1 ohm and X_L is 4 ohms, then X is 3 ohms (an apparent inductive reactance).

Through the wonders of trigonometry and Sketch 2, we can now find a total value for our impedance (Z) which is 5 ohms. Hence the standard formula: $Z = \sqrt{X^2 + R^2}$, which is the same as the one used for finding the hypoteneuse of a right angle triangle. Note that Z determines what AC current will flow in a circuit for a given voltage, by replacing R in ohm's law with Z: $Z = I/E$. We won't address phase shifting here, but it can be important.

IMPEDANCE IN ANTENNAS

Now then, antennas are said to have impedance. They have capacitance to ground, and the length of the wire has inductance with itself. These are not large values, but can be significant at MW and SW frequencies. Because reactance varies with frequency, the total impedance of one's antenna will also vary with frequency. At some frequencies (resonant frequencies), the inductive and capacitive reactances of the wire will cancel out, leaving a pure resistive impedance. This resistive impedance is more than simply the resistance from one end of the wire to the other, and is not just a mathematical fiction; a certain RF voltage applied to the antenna at the resonant frequency will only be able to push so much current into the antenna as defined by Ohm's Law and the resistive impedance of the antenna. At non-resonant frequencies the antenna will show a different impedance which has an inductive or capacitive element to it, and once again, only so much current can be pushed into the antenna at a certain voltage as defined by Ohm's Law and the antenna Z.

Maximum power transfer takes place when the impedance of the current generator (usually a transmitter) is the same as that of the antenna. This condition is a desireable one, as maximum power is available for radiation. It is also not a bad condition to have between an antenna and a receiver; in this case, the antenna can be thought of as the generator:



When $Z_a = Z_r$, maximum power is transferred between the antenna and the receiver, even if it is only picowatts, and maximum signal strength will be noted at the receiver. (This condition assumes the Z_a and Z_r are both resistive impedance; if there is reactive impedance at the antenna, it should be cancelled out with an opposing value of reactive impedance at the receiver). However, below 10 MHz or so, note that weak DX signals are usually limited by atmospheric or man-made noise, and you won't hear DX any better by matching impedance between a random wire and a receiver if the DX is buried in external noise already. The receiver signal will certainly be stronger if the receiver and antenna are matched, but so will the external noise. If the random wire is short or close to the ground, or the receiver is insensitive, then impedance matching may allow weaker signals to be heard than would be otherwise (though still stronger than the external moise level) but generally one can say that impedance matching should not be necessary between a good random wire and a good receiver.

IMPEDANCE IN BEVERAGE ANTENNAS

Beverage antennas can be a different kettle of fish however. They are not very efficient, but are quite directional; the antenna will attenuate noise originating from outside its lobes. Also, there can actually be some noise cancellation over the length of the wire even if the noise is originating in the same direction as the desired signal. Therefore our signal to noise ratio may be improved quite markedly over that of a random wire, and in situations where weak signals are poking out of the mud (sunrise DXing for example), we may need every picowatt our Beverage can deliver to our receiver, as there have been cases where a DX signal is actually buried in the receiver noise floor even at medium wave frequencies.

Beverage antennas generally have an impedance in the region of 300 to 700 ohms which is a not unreasonable match to (mostly older) receivers with "high impedance" antenna inputs. Even when using such a receiver, one may want to try to cancel out reactive elements of the antenna impedance using a pi-network coupler (see National Radio Club's Antenna Reference Manual's article by Russ Edmunds "Antenna Tuning Devices for Longwires on the MW BCB" or A DXer's Technical Guide 2nd edition, p. 61, published by IRCA), but that would only be necessary if one felt that potential DX was being buried below the receiver noise floor as opposed to the atmospheric or local noise floor (see "Noise Levels and Useable Receiver Sensitivity" by Chuck Hutton, pp. 6ff in A DXer's Technical Guide, 2nd ed.).

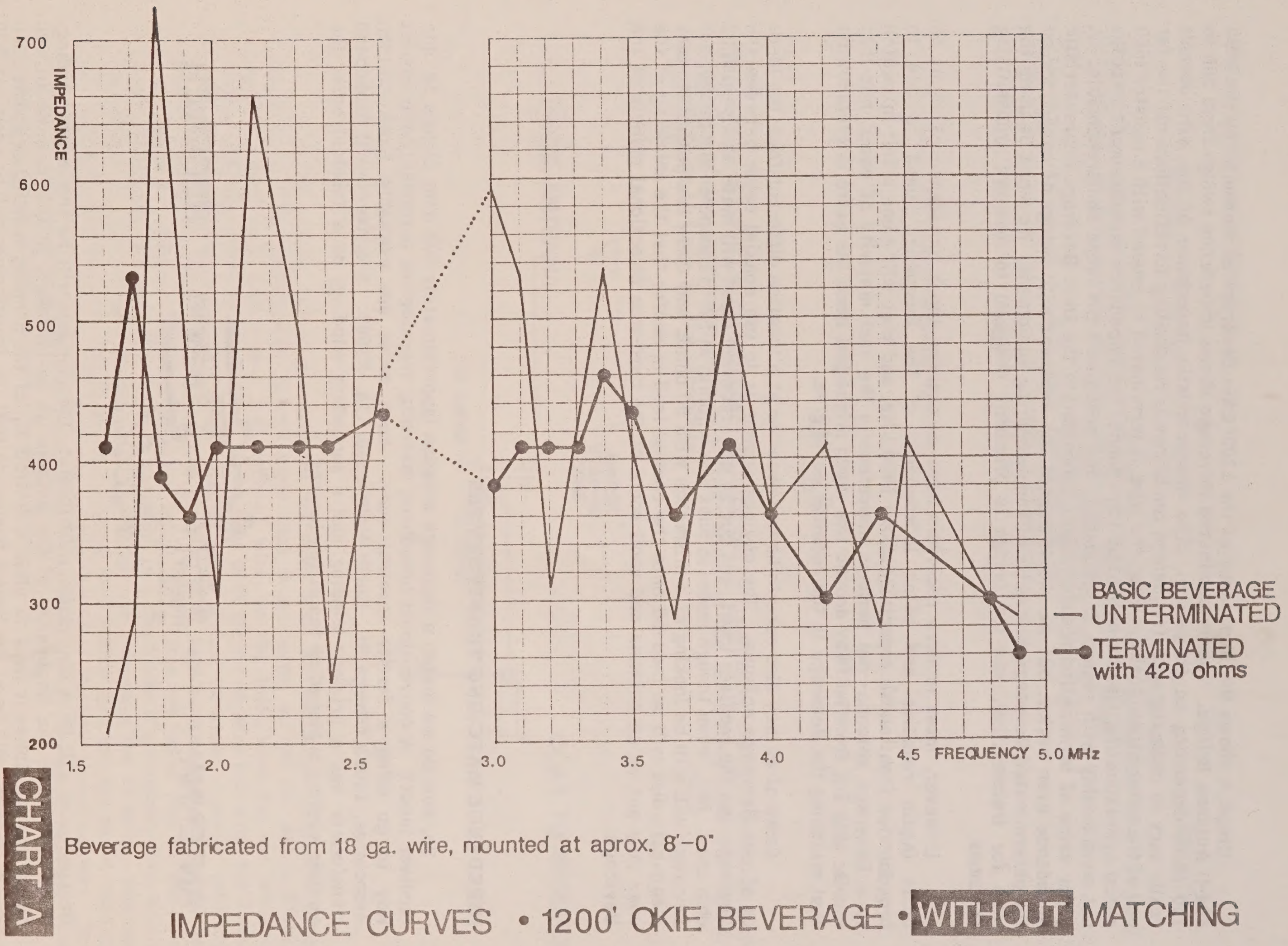


CHART A

Beverage fabricated from 18 ga. wire, mounted at aprox. 8'–0"

IMPEDANCE CURVES • 1200' OKIE BEVERAGE • **WITHOUT** MATCHING

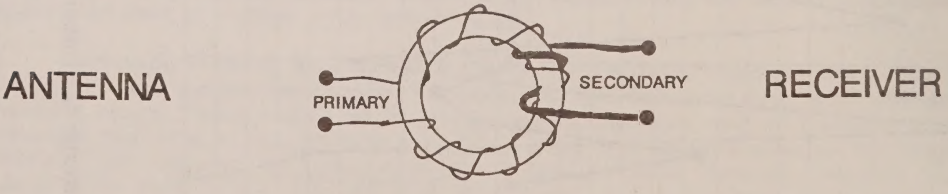
Graph A shows the impedance of the 1200' Okie Beverage as measured by the MFJ 204-B Antenna Bridge. The unterminated Beverage shows impedance swings from 200 to 700 ohms depending on frequency. The characteristic impedance of the wire doesn't really vary so radically with frequency; the bridge is responding to reflections off the far end of the unterminated wire. When the wire is terminated to ground with a resistor (560 ohms) approximating its characteristic impedance, the impedance measurement smooths out considerably with regard to frequency, and becomes a bit more comprehensible. A lower value of termination resistor might approximate the Okie Beverage characteristic impedance even better, but we should regard the apparent wild swings of impedance on the unterminated Beverage as a quirk of the measuring equipment. We won't be using the wire for transmitting, and the bridge is primarily designed to measure transmitting antennas.

However, most modern receivers have an antenna input impedance of about 50 ohms (again resistive and often independant of the frequency tuned to due to broadbanded front ends), especially above 1600 kHz, and that will mean a fair mismatch to a Beverage antenna—not perhaps important in the vast majority of cases, but that sunrise skip DX from halfway around the world might just need the extra micropicowatt that matching the Beverage to the receiver could give.

Some of us may also need to have a receiver at a location different from the lead-in of our Beverage antenna. The obvious answer is to use coaxial cable between the Beverage and the receiver input, and our 50 ohm receiver input will mate nicely with 52 ohm coax. But, even though losses in coax are minimal at SW frequencies and below, our Beverage will still be looking at a mismatch with 50 ohms, and there is a possibility that electrical noise will be induced onto the coaxial lead-in and/or that the shielding of the coax may act as an antenna and spoil some of the hard-won directional effects of the Beverage.

IMPEDANCE MATCHING TRANSFORMERS

So, how do we match a Beverage antenna (approximately 500 ohm Z) to a 50 ohm receiver input? A conventional broadband matching transformer is probably the easiest way to go using a ferrite toroidal core. Such cores are available from Amidon Associates, 12033 Otsego St., North Hollywood, CA 91607. A conventional broadband transformer has a primary winding and a secondary winding; on a toroidal core, the smaller winding is placed on top of the larger:



Because ours will be a step-down transformer, the primary will be the larger winding. First, one takes the impedance of the antenna to be matched, in this case about 500 ohms, and multiplies it by 4 to yield a desired X_L of the primary winding of about 2000 ohms. This X_L will be at the lowest frequency that the transformer will be used, say 500 kHz, if MW DX is anticipated.

$$\text{desired L of winding} = \frac{X_L}{2\pi f} = \frac{2000}{2\pi \times 500 \text{ kHz}} = .637 \text{ mH}$$

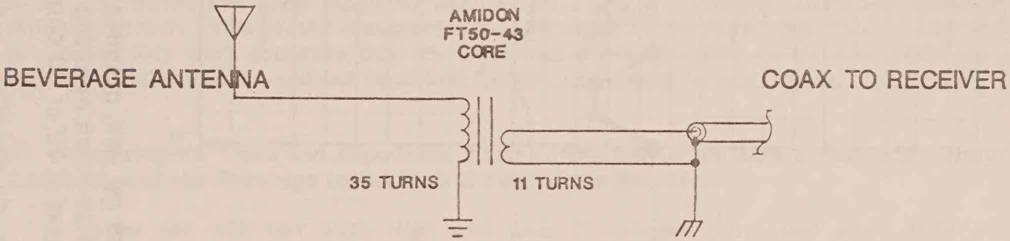
If one choses an Amidon FT-50-43 toroid as the transformer core, Amidon data will yield the following desired number of turns (N) for the transformer primary

$$N = 1000 \sqrt{\frac{\text{desired L (mH)}}{A_L \text{ (mH/1000 turns)}}}$$

A_L for the FT50-43 core is given as 523, so:

$$N = 1000 \sqrt{\frac{.637}{523}} = 35 \text{ turns.}$$

The number of turns for the secondary winding can be found using the same process or by knowing that the impedance ratio of a transformer is the turns ratio squared. Either method yields 11 turns for the secondary.



Toroidal cores are a bit trickier to wind than an ordinary cylindrical core. Fortunately, this transformer doesn't have that many turns, so we can use a simple method. Each turn uses about 0.85 inch of wire, so the total wire for our primary winding shouldn't be more than about three feet with plenty of wire left over for leads. As the core is small, wire of #28 or smaller guage should be used. I prefer ordinary magnet wire as its insulation is thin. Take the 3' of wire, tape or knot one end around the core, leaving a couple of inches to spare for a lead. Run the other end of the wire through a darning needle, affix the core carefully in a small vise if necessary, then weave the needle and wire through the center of the toroid until you have the 35 turns. One can also wind the desired wire length around a small flat bobbin thin enough to fit through the toroid center, and play the wire out as you weave it through toroid center. This method is absolutely necessary if many more turns than our 35 are contemplated. The secondary can be wound the same way using about 14" of wire.

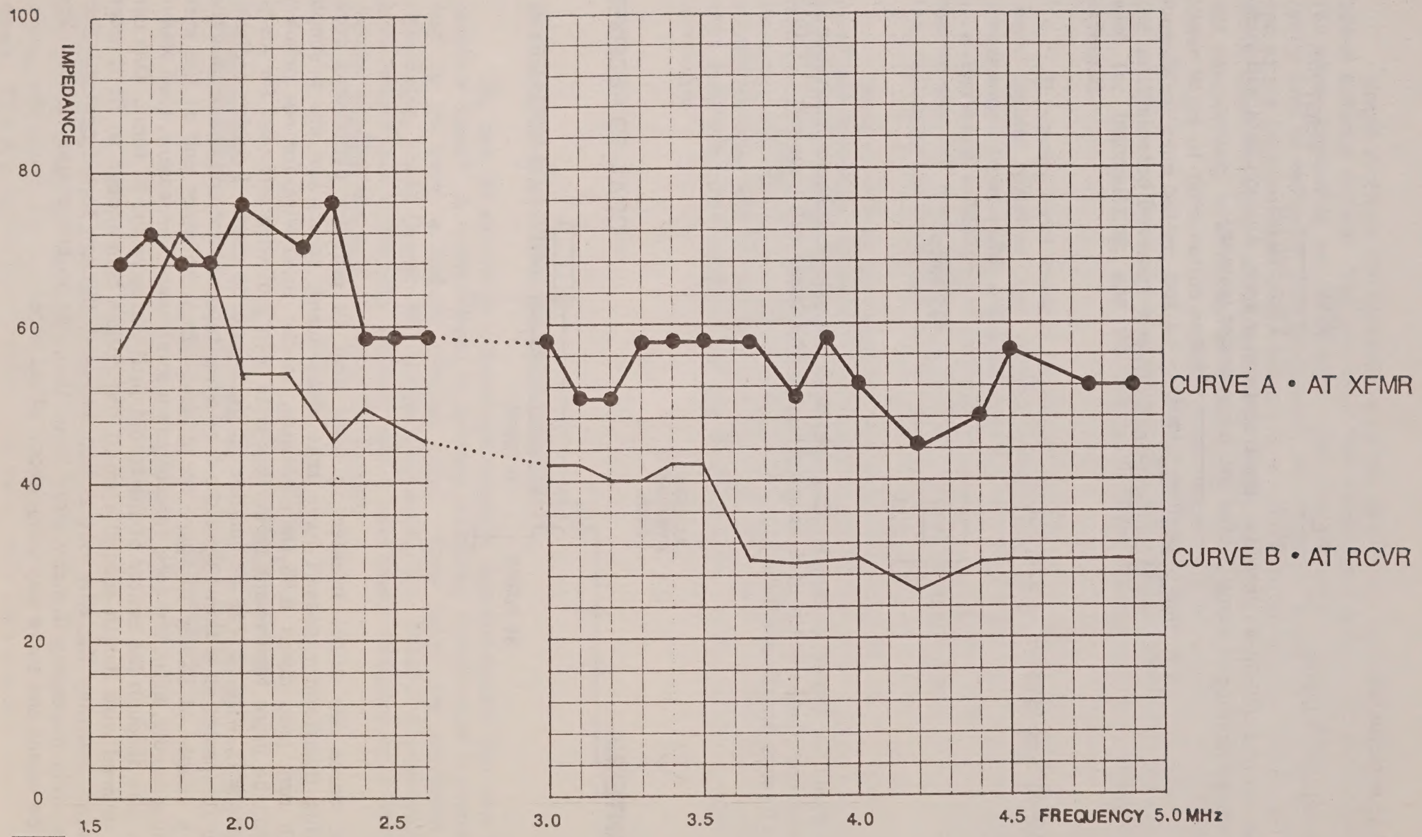


CHART B

Okie Beverage fabricated from 18 ga. wire, mounted at aprox. 8'-0"
Curve A was measured @ the Hall-Patch matching transformer
Curve B was measured at the end of 70' of 50 ohm coax with the transformer connected

IMPEDANCE CURVES • 1200' OKIE BEVERAGE • WITH MATCHING

If you want to be experimental, you could wind a 50 turn primary, and put taps every 5 turns or so and use a rotary switch or simple alligator clip to find at which tap signals are strongest on your monitored frequency.

I believe it to be most "sanitary" to use a separate earth ground at the primary rather than connect the secondary ground to it, if you are using a length of coax from the secondary to your receiver, but that may depend on how good an earth ground is available at the site. Separate grounds will help prevent the coax shield from picking up undesired signals or local electrical noise.

Chart B shows the apparent impedance of the Beverage antenna with the aforementioned matching transformer in place. Again, the impedance varies with frequency using the unterminated Beverage; but we should regard these swings as a quirk of the measuring equipment. The terminated Beverage measured through the matching transformer now appears to have an impedance of between 40 and 65 ohms over the range of 1.5 to 5.0 mHz, with much of the frequency range falling nicely around 50 to 55 ohms. We are certainly a whole lot closer to matching up with our 50 ohm coaxial lead-in and the 50 ohm antenna input terminal, and allowing for margin of error, we probably can't do a whole lot better. But so much for theory and somewhat abstract observations...How much of a difference does our matching transformer make when it comes to real DX'ing?

BRYANT:
THE PROOF OF THE PUDDING:

After about six months of testing and use, I have become convinced that the impedance transformer is effective. The comparison tests were all performed with my NRD 525, which has been modified with an outboard 4" diameter electro-mechanical milliamp meter. This meter measures signal strength at the receiver's AGC circuit and is considerably more accurate than the notoriously poor S-meter on the 525. However, this "test instrument" could not be called "laboratory grade" by any means. The tests:

1) Comparing 70' Coax and Impedance Xfmr connected to the Low Z Port with Direct Connection of the Beverage to the High Z Port of the Receiver.

Since the 525 has both High and Low Z antenna ports and since they are switchable, I was able to bring the receiver to the end of the Beverage, lay the 70' of coax out on the ground, hook up both the coax and the end of the Beverage itself to the two antenna ports and compare the two lead-in situations by shifting the switch and one jumper wire. I compared the two lead in methods at mid-day on the broadcast band with S-7 to S-9+10 signals. There was no discernable loss with the coax lead and matching transformer. There could have been the "1 db loss ber 100' of coax" rule of thumb but I couldn't measure it. Using the same method, I also compared the two lead-ins on 90 and 60 meters in the evening. This was naturally more difficult due to fading and QRN. I used the strongest, steadiest signals available - generally around S-8 to S-9. There was no discernable difference between hooking the Beverage directly to the High Z port and using the 70' of coax plus the transformer. I did "feel" however that there was the same 1 to 2 db loss as was probable on medium wave. Basically, the darn matching transformer WORKED and I could come in out of the cold and use the transformer and coax with no meaningful loss of signal strength or directional characteristics.

2) Comparing the 70' Coax Lead-in With and Without the Matching Transformer.

For this test, I "permanently" installed the 70' of lead-in to my Shack, put the 525 on the desk and ran comparisons using: a) the coax directly connected to the Beverage antenna. b) the same hook-up but with the matching transformer between the coax and the Beverage.

The tests were as before: medium wave at mid-day on strong steady signals (S-8 to 9), and in the evening on the best signals available on 60 and 90 meters. Thanks to the assistance of a long suffering spouse, these tests, too, were almost instantaneous.

The result:

NOT HAVING THE TRANSFORMER IN THE CIRCUIT COST ME 2 TO 2$^1/_2$S UNITS (10 TO 12 db) ON EVERY FREQUENCY TESTED.

Until others run the same tests, I cannot claim that my results will be universal. However, I'm willing to wager that anyone using a coax lead with a Beverage and NOT using a matching transformer is giving up at least 10db of useable gain!

IN USE TESTING:

Although I performed no comparison tests using weak, low arrival angle DX signals, I can share the results of two spring Equinoctal seasons hunting Indonesian stations.

Spring 1987: Numerous rare and difficult Indonesians were logged and QSL'ed including RRI Merauke, 3905 kHz. An unsolicited comment from the station manager (who opened the station in 1964) related that my report was only the second correct report from North America in the 23 year history of the station. The first North American report was from Bill Sparks of San Francisco.

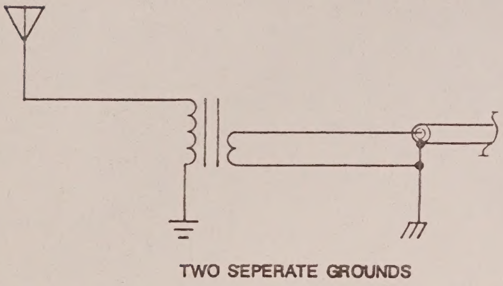
Spring 1988: Again, many rare and difficult Indonesians were logged. This season, a number of the very small "RKPD" stations were "in." Mitch Sams, Kirk Allen and I all three indulged in an orgy of Indo hunting. The Beverage plus transformer clearly outperformed the other DX antennas. There were several instances when Kirk and Mitch could only hear hets and I would have very useable audio. These included RRI Mataram and RKPT2 Manggarai.

CONCLUSION:

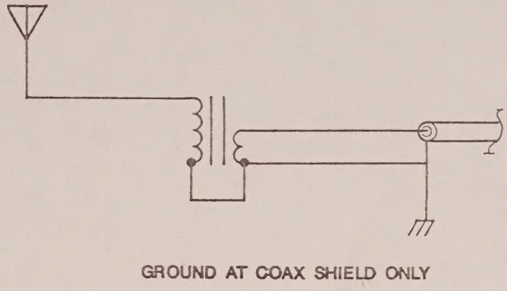
A) If you have to use a lead-in with a Beverage antenna, use coax so as not to destroy the directional effects of the Beverage.
B) If you must use a coax lead in with a Beverage, a toroidal core-based matching transformer will probably save you 10 to 12 db of signal loss.

AFTERWORD:

There are at least two possible arrangements useable to connect the transformer into the antenna/receiver/ground circuit. They are:



CIRCUIT A

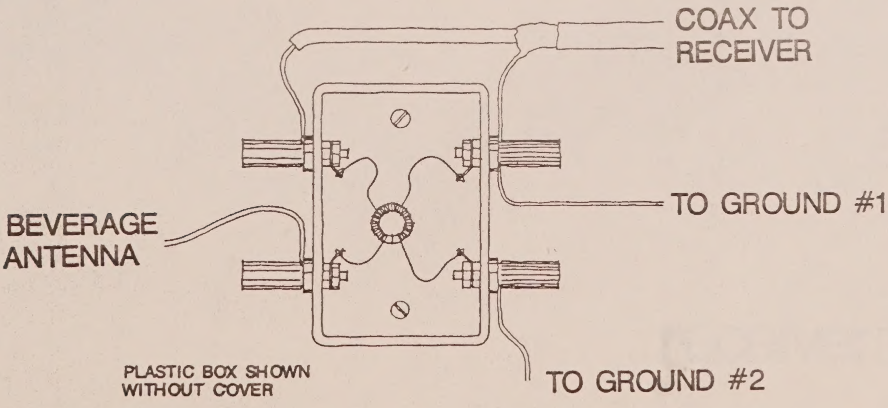


CIRCUIT B

Nick Hall-Patch and I prefer Circuit A. He feels that it is cleaner and will, theoretically be "lower noise" if there is a good RF ground available. I compared both circuits and found them to deliver equal signal strength on 60 meters and below.

However, careful checking showed that Circuit B caused significant loss of directional characteristics when compared to Circuit A. It would appear that Circuit A should only be used where a good RF ground is not available within 4 or 5 feet of the antenna end.

Finally, the wire used in fabricating this transformer is almost hair-thin. The whole transformer is quite fragile. I mounted the transformer in a small (2" x 3" x 3/4") plastic project box from Radio Shack, fixing the toroidal core to the back wall of the box with a dab of silicon sealant. The wires are then fed out through four binding posts. The top two binding posts are the 50 ohm winding while the bottom two are the 500 ohm primary winding. The two left binding posts are the "hot" side and are red; the right side black posts are the ground side. I have the box mounted on the wall now. (See drawing below). I should note that, with this arrangement, I must scrape the weather - induced corosion off the leads every 60 days. Now that the experimentation is complete, the whole thing will be weather proofed with coax sealant.



receivers

JUST BECAUSE IT HAS HANDLES DOESN'T MEAN IT'S A PORTABLE

AN INFORMAL REVIEW OF THE HQ•150

D. SHEEDY

I dunno about you, but every few years I get the urge to add another piece of equipment to my already overloaded DX desk. So, in early 1985, I was on the lookout for a nice example of tube gear. I wanted a Hammarlund, as they have an enviable rep as BCB DX machines. If possible, I wanted one built in the late 50's or early 60's. Reading NRC's DX NEWS, I found an HQ150 for sale by Dick Truax of Louisville, KY. What particularly intrigued me about this set was that it had been extensively modified in the 1970's by Bob Foxworth and written up in the NRC Receiver Reference Manual (1). I had read that article when it originally came out and was impressed with the scope of the modifications plus, it was "history!" "Far out!," I thought, "a classic radio and with some nifty additions as well....where's the checkbook?" It was almost that easy, an exchange of letters with Dick Truax, a money order, and soon I had a large, heavy box taking up a fair amount of the available floor space in my house.

After pulling out my all-purpose hunting/disembowelling/box knife, I was wading in styrofoam "popcorn" and the gray bulk of the HQ150 was sitting on the woodstove. I was the owner/operator of a SERIOUS chunk of radio nostalgia with knobs, switches, and a cute set of carrying handles. What next?

Of course, like any other right-thinking DXer, it was time to see if the beast worked as well as expected. I pushed the Icom R70 and Drake R4B off the DX desk, manhandled the HQ150 into position, plugged in an antenna and headphones and hit the power switch. Ahhh! Lights! Static! The smell of tired electrolytic capacitors waking up...and severe audio hum. Uh-oh. Not funny. Not even mildly amusing. Not bad enough to prevent DXing, but like a dripping tap, in time it would make me twitchy (OK, OK.. twitchier). What caused it? Impedance mismatch with the 8ohm headphones I was using? Power supply problems? Grungy tubes? Drawing on 3 years of experience wrestling ham radio gear into operating shape, I naturally picked the simplest solution-impedance mismatch, until a note from Dick Truax said "no way.." OK, no more Mr. Nice Guy. Time for hands-on trouble-shooting.

The HQ150, weighing about 44 lbs. is not especially "user friendly" when it comes time to pop the chassis out of the cabinet, so I spent a little time debating with the set about the wisdom of dismantling it without causing damage to both of us. (Note: Never argue with a radio that weighs enough to hurt you). But eventually I got it apart, warmed up the soldering iron, and began hi-tech evaluation of the hollow-state circuitry. I beat on the power supply transformer, resoldered a lot of what I hope were cold solder joints and wiggled tubes and a few stray capacitors. One of the joys of tube gear is that you can actually SEE the components and repair or replace them...or easily damage them beyond hope, but at least you can SEE what you're doing!

I could have gone to a movie for all the good this personal attention did. Turn the HQ150 on and .....HUMMMMMM. Well, that didn't prevent me from DXing with it for a few weeks. But in the interests of preserving my sanity, I finally unhooked the set, stashed it above the refrigerator, brought the R70/R4B out of the closet, and went back to "modern, soulless," but quieter, DXing.

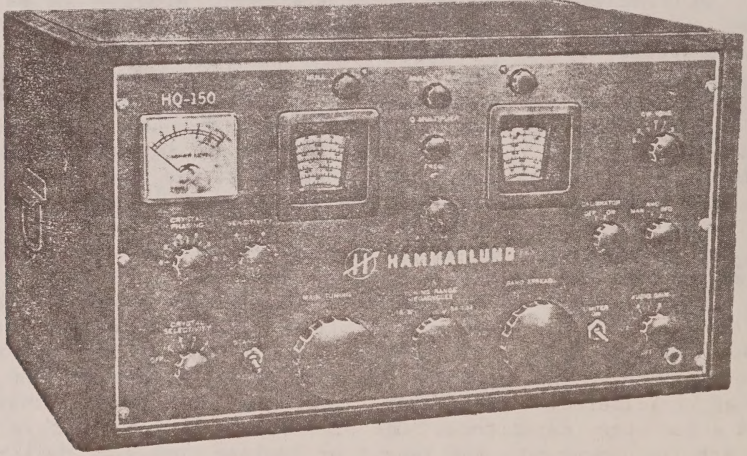
The HQ150 would probably still be gathering dust as a spider condo if the first useful idea for getting it repaired hadn't shown up a few days later... a bit scruffy and shopworn, but an idea, nonetheless. A few years previously, I had Steve Bohac rework a Hammarlund HQ180 for me. He did his usual outstanding job. I realized he could probable fix the hummy `150 if anyone could. Letters zipped across the country, and yes, he had the time and inclination to take a look at the set. Down came the `150 from refrigerator exile and off it went to

Steve in the wilds of New Jersey. I went back to DX, work, the gym, and impractical, but ingenious antenna schemes. Months passed. I got a tan, helped edit FT, and almost forgot about the `150. However, in early 1987, twinges of apprehension made me drop a note to Steve asking for a progress report. I got a prompt letter back detailing the ups and downs of the HQ150 repair process.
It seems the power supply was faulty (causing the hum), several tubes were in less-than-optimum condition, and there were numerous questionable solder joints. All these problems apparently cropped up over time....as soon as the set would be ready to ship, it would go belly-up and Steve would dig back into it, find the trouble, repair it and get it ready to ship once again. Finally, it passed the "ultimate, totally final, I-mean-it-this-time" checkout and was on its way back to me. Ahh! Success!

Well, well...a large, heavy box on my floor, deja vu′ or what? Out with the knife, and surprise! No styrofoam "popcorn" this time .... Steve had packed and stabilized the set with some sort of expansion foam, so I got to carve a little bit more. At last!

The HQ150 actually glowed with health and vitality. Off to the closet went the Icom/Drake system and OOF! up went (PANT! WHEEZE!) the `150 onto the desk. Let′s see: antenna? check. Headphones? check. OK, power on and NO HUM! Just clean, beautiful, tube-generated audio. I was back in the nostalgia DX biz again.

It might be nice at this time to give a quick run-down of the HQ150 specs, before getting to the subjective portion of the review. So for all you specification addicts:



First manufactured in 1956 (reviewed in QST for December, 1956), the set incorporates 13 tubes in a 11 1/4" x 20" x 12 1/2" (HWD) cabinet weighing 20 kg./44 lb. and operates on 50-60 Hz/105-125 VAC. Frequency coverage from .54-31 MHz in 6 bands (.54-1.32, 1.32-3.2, 3.2-5.7, 5.7-10.0, 10.0-18.0, 18.0-31.0) with electrical bandspread on the last 4 bands. The bandspread dial is calibrated for the 80, 40, 20, 15, and 10 M ham bands with a 0-100 logging scale for SWBC use. It has a 100 kHz crystal calibrator, a Q-Multiplier, a 5-position crystal filter with phasing control, variable BFO, and a host of other knobs which regulate volume, RF gain, and generally keep your hands busy.

The multiple selectivity positions available give a variety of adjustable bandwidths to play with...the nominal AM bandwidth is 5 kHz @ 6 dB, 9.6-9.8 kHz @ 60 dB, great for program listening and semi-intense DX. Audio quality with this stock filter is a real treat. If you're used to either solid-state "audio" or the earlier Drake gear, this set will make your eyes light up.

For DXing in crowded conditions, switching to the crystal filters yields the following selectivity options:

1:	2.0 kHz @ 6 dB	6.0 kHz @ 60 dB
2:	1.7 kHz @ 6 dB	5.1 kHz @ 60 dB
3:	1.0 kHz @ 6 dB	4.9 KhZ @ 60 dB
4:	0.4 KhZ @ 6 dB	3.0 kHz @ 60 dB
5:	0.2 kHz @ 6 dB	1.5 kHz @ 60 dB

All the above values are extrapolated from the chart in the manual, so they're rough approximations. Incidentally, the "ultimate rejection" of the filters looks pretty good. Even at the widest crystal position, it's still under 7 kHz @ 100 dB. The crystal phasing control acts a bit like bandpass tuning. Careful adjustment of it will increase the readability of a signal when using a narrow filter. This is helpful when you have 1.7 kHz or less of audio to work with.

Yes, you lose the great audio quality, but it's also possible to sneak up on those QRMed signals (try 49M during your local evening) and extract useful audio, which is the reason for all this tweaking anyway, no?

If you've never used a Hammarlund bandspread scheme before, you're in for some fun times. First, turn the set on at least 30 minutes before you want to use it! We're dealing with a VFO and tubes and all those sorts of drift-prone components, so the time can be spent arranging the ....yup, BAND CHARTS.... or more precisely, calibration charts. Use whatever paper is handy, though graph paper seems to make the whole exercise a little tidier. Use the left-hand side for the frequency and the right-hand side for the bandspread logging number. Most of you will be able to do a band per night without getting flaky. It's time consuming, but it pays off when that NE Bolivian opening hits on 90M. Nowadays, there are enough stations on the higher bands (49-13M) to get a fairly accurate chart for each 5 kHz of the band in question. 60M and below are a bit harder, but even there the number of easily IDed "marker" stations is good enough for a 1st draft.

The manual charts the frequency coverage for the bandspread dial for each of the 4 bands from 3.2-31 MHz. For example, on the high end of the 5.7-10 MHz band, the bandspread covers 0.9 MHz from 100-0 on the logging scale (you start at the TOP of the band and tune DOWN) 60M is spread out in 1.25 MHz hunks and 90M takes up the entire 100-0 scale (so the full enjoyment of the static and UTEs comes through).

So that this casual evaluation doesn't become War and Peace, I'll touch quickly on a few observations and close with an overview. The IF is 455 kHz and on the Foxworth-modified model, provision is made for an external digital read-out. ECSS (NSHD, or whatever) is touchy, but patience (and sufficient warm-up time) helps. The Q-Multiplier was one feature I only played with a few times-mostly to get it to oscillate-as the gain/selectivity of the set without it seemed quite good. The 100 kHz calibrator is handy, but an external one with 10/25/50/100 kHz points could be used for better accuracy.

OK..it's getting late, I want to check out 60M..on goes the R70 and the HQ150 has already been on for about half an hour. Hmm, 0300 UTC and the '150 hears everything the Icom does and the audio is better..how about morning DX? Yawn. It's 1230 UTC (don't laugh, that's 4:30 a.m. PST), Asians are all over 60M; Malaysia-4950 is a reliable powerhouse, Hanoi HS-4894.7 mixes with another RTM outlet on 4895. Separable on the R70 and, yup, separable on the Hammarlund, too. In fact, to cut all this short-every station audible on the R70 was audible on the `150...Burma-6570, even a few dinky RRI outlets. On BCB, it was no contest. The Icom tends to overload thanks to my local RF climate but the HQ150 handled the band easily! (I wish I still had access to my BCB loop..) I even dabbled in some program-listening...the clear, clean tube audio made "Musica del Ecuador" and George Collinet's "Sound of Soul" almost hi-fi.

Well! Do I like the HQ150? You bet. Would I use it as a primary DX receiver? Certainly! Would I give up the Drake and Icom gear for the sake of tube-only purity? Nope. The Hammarlund is still an outstanding set, but the newer receivers are just easier to operate in today's crowded conditions. I would, however, use it in lieu of the Icom on BCB any time.. I've yet to find/use a solid-state receiver that could out-perform a tube rig on that band.

In closing, I'd like to thank Steve Bohac for "making it all better," Bob Foxworth for the original mods, Dick Truax for keeping it available, and all the unknown engineers, techs, and assembly folks at Hammarlund for a legendary piece of gear.

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1. B. Foxworth, "Random Thoughts About Receivers," in <u>NRC Receiver Reference Manual</u>, NRC Publications Center, Box 164, Mannsville, NY 13661

SIZING UP THE HAMMARLUND HQ•180A IN THE 1980'S

MITCHELL A. SAMS

How can an early 1960's vacuum tube technology receiver fit into today's world of microprocessor-controlled, synthesized, miniaturized, digitized, solid state communications receivers? After a bit of research the answer I arrived at is, surprisingly, "very well indeed". The receiver is the famous HQ-180A. I discovered that, for about $500, I was able to buy a perfectly restored and highly modified Hammarlund HQ-180A with performance comparable to today's receivers priced near $1500. That's great news for somebody like me who was "raised" on a tube radio and also enjoys collecting antique radios.

I've only had the opportunity to put the HQ-180A up next to a a modified FRG-7 (with a Collins mechanical filter), R-390, R-388 NRD-515 and NRD-525. In addition, over the past 15 years I have operated, sometimes only briefly, the following receivers: Drake R-7A, a couple of newer Racals, Watkins Johnson WJ-8718, Icom R-70, various Hallicrafters, Hammarlund HQ-150, FRG-7700, Kenwood R-1000, plus a few other less significant receivers. Certainly not a complete comparison, but enough, I think to offer up a fairly educated opinion. And, this is an opinion. I have not attempted to approach this from a technical standpoint.

You're probably saying, "Haven't we heard this before?". Maybe you have. It's no secret that this receiver is considered to be one of the all time great tube sets, and several of you who have owned one in the past are very familiar with that fact. But, the point I want to make here is that this receiver can stand with the best of the "new" technology receivers of the '80s, for less than half the cost. That is a point well worth making, but one that hasn't been emphasized. Contrary to what you may think, the HQ-180A has had very few reviews over the years, the only real review I could find in SWL literature was one by Dan Robinson in the February 1982 FRENDX (my collection goes back to 1968). That review convinced me to buy my HQ-180A.

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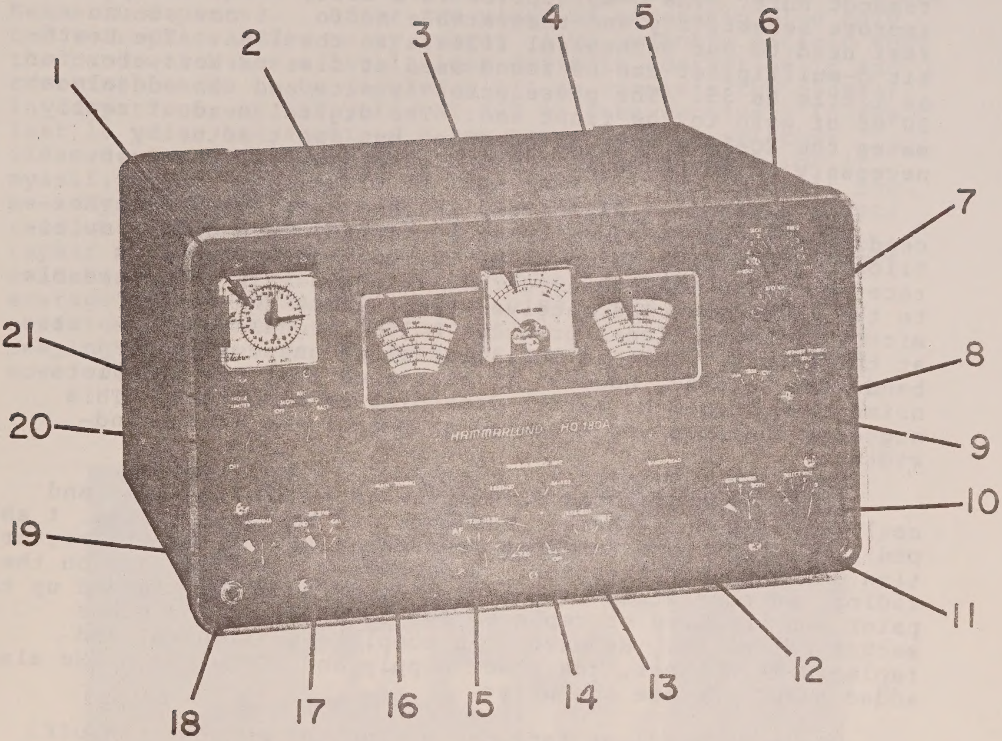
A Giannini Scientific Co.
53 West 23rd Street, New York 10, N. Y.
Export Department: 13 East 40th Street, New York 16, N. Y.

I think it is becoming increasingly more difficult and expensive to buy a truly DX-oriented communications receiver today. It is amazing that a person must spend $1000 or so for a good receiver, and then spend a few hundred more to put the filters in that should of been installed in the first place. I know it's a matter of trying to keep costs down, but if I spend that much money on a receiver, I want superb performance. Selectivity should have been one of the first areas addressed in the receiver design. The HQ-180A offers a viable solution to this dilemma by offering a very high performance-to-cost ratio, with as much or more flexibility as you'll ever get today.

Don't get me wrong, this receiver isn't for everybody. It requires some appreciation for vacuum tube technology, and, yes, a little extra care and initial attention, particularly if you are purchasing a 3rd or 4th-hand receiver. I'm not saying that its the last reciever a person ought to buy. I would like to own a JRC NRD-525 or Drake R-7 class receiver one day. However, at the moment I'm not tempted to turn loose that much money (and neither is my wife, ha!), especially when the bottom line improvement in performance (i.e. "hearability") is not easily noticeable. Other than synchronous detection (which few receivers yet have), phased lock loops, improved mixers and microprocessor based features such as memory storage/scan, mode control, synthesized tuning, etc. there haven't been many technological advances incorporated in receivers today that have enhanced the receiver performance, in terms of useable selectivity. It has mostly been a repackaging effort using solid state, digital circuits, miniaturized components and microprocessor control resulting in a vast improvement in operational ease and portability.

Looking at figure 1, beginning in the upper left hand corner and moving counterclockwise, I will describe the 180A's controls. The AC power ON/OFF switch and mixer trimmer pot are located on a panel where the clock/timer was (see fig. 2). Below that are the variable noise limiter pot and a 4-position AGC switch (OFF, SLOW, MED, FAST). These AGC settings correspond to a 1 sec, 0.1 sec and 0.01 second decay time. Attack time is 0.001 seconds. The next two controls below that are the antenna trimmer and a 3 position switch for "Receive", "Send" and "CAL". I use the "SEND" position when not listening. The "CAL" position activates a 100 kHz crystal calibrator. To the right of that is the main tuning, AF gain, bandswitch, RF gain, bandspread, sideband selection switch (UPPER, LOWER, BOTH) and the selectivity switch. The 6 dB bandwidths are upper/lower 1-2-3 kHz, both sidebands 0.5-2-4-6 kHz. Above this is the mode select switch (AM,SSB,CW) and the vernier passband tuning (+/- 3 kHz). To finish out the front panel, there is a BFO control, slot filter (+/- 5 kHz with 40 dB of attenuation, additional 20 dB available at specified frequency by manual adjustment), a dial adjustment, and a dial light on/off switch (which was an added modification, see fig. 3).

I purchased my HQ-180A from Serge Neumann for $200 (this reciever was previously owned by FTer Jon Williams.). This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HAMMARLUND HQ 180A

1. Clock Timer
2. Main Tuning Dial
3. "S" Meter
4. Band Spread Dial
5. Dial Calibration
6. "SLOT FREQ" Control
7. "BFO" Control
8. "VERNIER TUNING" Control
9. "AM-SSB-CW" Switch
10. "SELECT" Control
11. "SIDE BANDS" Control
12. "BAND SPREAD" Control
13. "RF" Gain & 'AC" Switch
14. "TUNING RANGE" Control
15. "AF" Gain Control
16. "MAIN TUNING" Control
17. "SEND" "RECEIVE" "CAL" Switch
18. Earphone Jack
19. "ANTENNA" Control
20. "NOISE LIMITER" Control
21. "AVC" Switch

HAMMARLUND

HQ-180A

Fig. 1. Receiver front view.

deal included a Q-multiplier, preselector and KRS digital readout unit. The Q-multiplier is a must, for it helps improve selectivity and recoverable audio. I now see no real need to put mechanical filters in the 180A. The Heathkit Q-mulitiplier can be found used at flea markets,etc. for as little as $5. The preselector is nice and can add almost 20 dB of gain to the front end. The digital readout really makes the HQ-180A easy to operate, but isn't actually necessary if you have a second digital readout receiver.

The HQ-180A's sensitivity is excellent, meeting or exceeding all the receiver specs I checked, including a multi-kilobuck Watkins Johnson. The HQ-180A generates less receiver noise than today's receivers and this is noticeable to the listener. The receiver spec claims that a 1.5 microvolt input signal produces a 10:1 signal to noise ratio at the output. This is qualified at an unspecified IF bandwidth setting, however it is stated that the signal-to-noise ratio could be better depending on bandwidth. This suggests the spec was measured at one of the wider bandwidths.

At this point I had $200 invested in the receiver and could have stopped there. But upon Dan Sheedy's advice, I shipped it off to Steve Bohac in New Jersey for a complete restoration and some modification. Steve did a beautiful job on the radio! He completely cleaned it inside and out, touched up the paint and repaired or replaced switches, gears and other mechanical parts. He gave it a complete realignment and replaced worn tubes, the power supply and old wiring. He also added a BNC antenna connector.

The modifications included moving the AC power on/off switch off of the RF gain pot to a dedicated switch. This switch is located on a new panel which replaced the worn out clock/timer. Also added to this panel is a mixer trimmer control. Steve added a small circuit board under the chassis which is controlled by this pot. Quoting Steve's description of operation; "The mixer trimmer incorporates varactor circuitry and enables the operator to peak the receiver's mixer circuitry at any point (frequency) in the tuning range of the receiver between 540 kHz and 30 MHz. It thus compensates for the small amount of mistracking inherent in the multi-gang main tuning variable capacitor. Though this mechanical/electrical mistracking is small, it however means as much as 3 to 4 S-units and signal-to-noise ratios are dramatically improved. The absolute worst case occurs on the 15.35 to 30 MHz range. The modification operates in practice much like the antenna trimmer, however, it is in the mixer stage". Total cost for this work was a little over $300. This has given the receiver many more years of productive life, with potentially less maintenance hassle, as well as some added features.

There are some disadvantages, though, to owning the 17 tube HQ-180. It's a large receiver, weighing about 40 lbs and measuring 10.5" H X 19" W X 13" D. So, you'll need some room for it. You may experience difficulty and some extra expense finding some spare tubes and parts (Steve Bohac has some stock Hammarlund parts). After two years of ownership I've only had to replace a few noisy tubes. I've recently noticed that the bandswitch has a little less definite contact to it and sometimes needs to be jiggled a bit to complete the contact. In comparison, my Lafayette KT-200 (a tube receiver) in the last 15 years has required a new power supply, switches cleaned, new dial chord and one tube replaced. I align it myself, or an experienced TV repairman I know can do it for me. My FRG-7, which could be considered a low maintenance receiver, needed $100 worth of work two years ago to repair the digital readout, to replace two worn out plastic switches, and to realign. I think it is easier for the average person to maintain on an older tube set than the newer ones. Because of the potential for high labor costs, keeping a newer receiver over the long haul can easily be more costly.

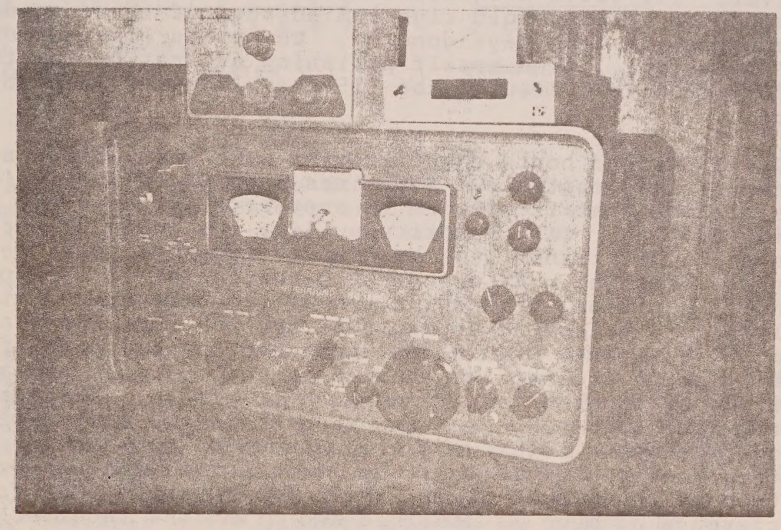
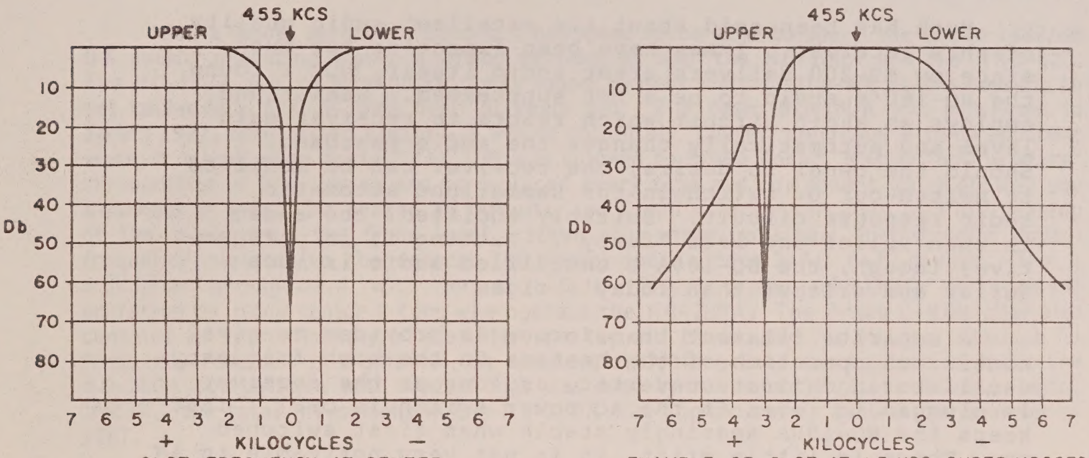


Fig. 2. The author's HQ-180A with Q-multiplier and digital readout resting on top of the receiver. Note the non-stock oversized bandspread tuning knob.

Some other things: I notice at times that very strong images appear between 5100 kHz and about 5250 kHz, mostly in the evenings, originating from the 49 meter band. Image rejection of modern receivers can be better because of upconversion (e.g. 70 MHz IF). Additionally, crossmodulation can be a problem at times with the HQ-180. Operationally, the receiver is difficult to switch from band to band very quickly. This task may require several cranks on the tuning knob, especially if you are at the other end of the dial. Also, the antenna trim and mixer trim may have to be peaked. I usually rely on the FRG-7 to do the quick scans. Operationally this is where today's microprocessor controlled receivers have a big advantage.

I like the feel of this radio. It has well-lit dials and the largest S-meter I've ever seen on a receiver. The glow from the lights and vacuum tubes at night takes me back to my early days of DX with a tube radio. I'm referring to the 7 continuous years of DX, from grade school into the first part of college, that I spent with the KT-200. I have a lot of memories from the excitement of hearing new countries while staring that brightly lit dial in the face at all hours of the day and night. When I got a hold of a NASWA country list in 1980 I discovered that I had experienced that 172 times with this analog-readout, vacuum-tube, wide-bandwidth receiver. The solid mechanical touch to the switches and tuning knobs of these old rigs reminds one of the ruggedness of construction from days gone by. To me its like owning an old '55 Chevy. I find myself polishing and caring for the HQ-180 much like I treated the '55 Chevy I owned in high school.

One can spend hours experimenting with the various settings of the receiver controls. Sometimes when DX is slow, I'll look for a station that is crowded by another or bothered by a utility station. I'll practice nulling the interference while still maintaining the best audio response possible. I'm still learning. By using the Q-multiplier in the "peak" or "null" position, steepening the IF response curve with the Q-multiplier, selecting upper,lower or both sidebands, an IF filter width from 0.5 to 6 kHz, passband tuning, notch filter, RF gain, noise limiter, AGC response; the operator has a multitude of combinations from which to choose. There are several approaches one can take when attacking an interference source. Choose a relatively wide bandwidth such as 4 or 6 kHz and then steepen the IF curve by 18 to 20 dB with the peak function of the Q-multiplier, shift the passband away from the interference as much as possible and bring the receiver's notch filter into play against the source of QRM. This approach tends to maintain better audio quality from the desired signal, but is less effective against a very strong interference source. By selecting upper or lower sidebands and in effect going to 2 or 3 kHz bandwidth, this will do a good job in reducing the interference. Thus making the passband and notch even more effective. It also frees up the Q-multiplier so that its notch function can be used to supplement the receiver notch. I find that once the controls have been set, the passband and two notches can be worked together against interference sources. Shifting the passband window into the signal more in order to optimize the desired signal while simultaneously bringing the notch to bear against interfering heterodynes or other sources of QRM is a pretty straightforward operation.



SLOT FREQUENCY AT CENTER

EXAMPLE OF SLOT AT +3 KCS SUPERIMPOSED ON THEORETICAL 455 KCS PASSBAND CURVE

Fig. 3. An example from the HQ-180A owner's manual showing the performance characteristics of the excellent notch, or slot, filter.

The designers of this receiver had the foresight to incorporate selectable sideband tuning in AM as well as SSB. Thats a very useful and much-appreciated feature as far as I'm concerned. I pretty much had DXed on my own those first few years (quoting John Bryant: "I thought I invented the hobby!") and grew accustomed to tuning only in AM, not SSB.

The variable noise limiter control is about the best and most effective that I've used. Being variable it gives the operator control over the amount of clipping desired. This circuit assures that noise peaks will be no higher than the signal, providing both positive and negative clipping. Most table-top Japanese receivers in the kilo-buck class now employ noise blankers. Another feature you don't see much of today is an RF gain control. I find it very useful when a weak signal is buried in noise. I just back off the RF gain a bit. In this situation it has made the difference a couple of times.

The 3 AGC settings get a lot of use in my shack. The slower (one second decay) AGC response is very effective in reducing high rate flutter or cochannel fading, pulse based interference or high frequency noise. However, it causes intolerable blanking of the receiver in the presence of any household electrical switching or static discharge.

Much has been said about the excellent audio quality of this receiver. I may have been expecting too much, since my KT-200 delivers great audio itself, but I found the HQ-180's audio to be a bit suppressed. Hammarlund employs an audio circuit which reacts to receiver gain level and automatically changes the audio passband. Should the owner so desire, the receiver can be modified to switch-out or switch-in the Hammarlund automatic audio response circuit. Suitably modified, the audio is then fuller and less "fuzzy". Putting it in perspective, though, the HQ-180A's unmodified audio is much fuller and crisper than today's rigs.

A separate filament transformer is provided to give continuous operation of the heaters in the high frequency oscillator and first converter, as long as the receiver is plugged in (even if the AC power switch is OFF). That keeps the HQ-180A amazingly stable when first switched on. There is little drift, it is not very noticable in AM, slightly more so in SSB (especially above 10 MHz). The added dial light switch comes in handy, allowing the lights to be turned off when the receiver is left on. This cuts down on the distracting light at night and also reduces by quite a bit the heat generated by the receiver.

The HQ-180A may be more famous for its medium wave performance. It certainly seems to be very "hot" in this area and seems to produce better audio out of a weak signal than other receivers I've used. Two things I would have changed in the 180A's medium wave design are: (1) the bandspread is switched out in MW and I would prefer it to be operational (2) the receiver will not tune below 540 kHz on the main dial.

The HQ-180A owner's manual is like nothing I've ever seen: full of technical, maintenance and operational details about the receiver, including charts, graphs and tables of data. It covers just about everything.

I don't want to appear overly-enthusiastic in this review, but I hope I have made the point that this vacuum tube receiver is unsurpassed by very few other communications receivers I know of. The HQ-180A is a joy to operate and adds a touch of nostalgia to the hobby. I plan on buying a new receiver someday, but I probably will never sell the HQ-180A.

Established
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HAMMARLUND
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A Giannini Scientific Co.
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A HIGHLY MODIFIED HQ•180A
VERSUS
A MODIFIED NRD•525

JOHN H. BRYANT

For a whole series of reasons, I happened to be able to spend the entire 1987/88 DX season operating highly modified versions of both the HQ-180A and the NRD-525. The HQ-180A was, as strange as it may sound, as near state-of-the-art as it is possible to get technology that is well over 20 years old. The basic HQ-180A was purchased in Spring 1987, from David Potter. It was in absolutely "cherry" condition with no apparent wear; it wasn't even dusty! The 180 was shipped to Steve Bohac, master "hollow state" rig modifier in New Jersey and he replaced every tube and component which showed any weakness or wear. He peaked all circuits, and added varactor circuitry to allow peaking of the mixer from the front panel. Steve also wired up a new Torrestronics digital frequency readout (to the nearest 100 hertz) and a Drake 2-AQ Q-Multiplier. The Q multiplier arrangement with normal L-C IF filters is the selectivity arrangement preferred by many senior DXers who operate the HQ-180A. The Drake Q Multiplier also contains an approximately 5" diameter speaker which was used for SWLing, although its frequency response is mediocre. In essence, everything that can be done to make the HQ-180A competitive with modern rigs was done by ace modifier Steve Bohac. Paying "retail," the total investment in the HQ-180A was approximately $850 in the summer of 1987.

The NRD-525 was also highly modified, this time by Dwayne Jones, the soldering iron maven at Universal Shortwave in Reynoldsburg, Ohio. The 525's truly excretable IF filters were complemented by two of the fabled Collins mechanical filters - a 1.9khz and a 2.4 khz. The highly decorative but nearly useless so-called digital LED S-meter on the 525 was left in place and operating. However, this 525 now sports a 3" diameter real electro- mechanical S-meter mounted externally and fed from a female jack mounted on the rear panel. Investment in the 525 so modified was above $1,600, slightly.

It seemed a fair test: a highly-modified version of one of the "finest ever" tube-type receivers going one-on-one against a highly modified version of the latest "state of the art/top of the line" black box from Tokyo.

I do not possess the instruments to produce, nor do I care about, "test bench" numerical comparisions of various design parameters of communication receivers. The results listed below are subjective. However, they were developed throughout an entire DX season with the two receivers sitting side by side and sharing three antennas. (AD Sloper, 60' L antenna, 1200' Beverage).

Basic Receiver Sensitivity:
On the Tropical Bands and on Medium Wave, the NRD 525 is more sensitive than the 180A to the very weakest signals, but not by much! About 90% of the time, there was no noticeable sensitivity difference between the two receivers. However, on a few very important signals, the 180A got a "strong het" while the 525 produced useable audio. To repeat, 90% of the time, there was no discernible difference in sensitivity. However, never once did the 180A out-perform the 525 in this important arena.

Basic Receiver Selectivity:
As modified with $350 worth of Collins mechanical filters, the 525 is more selective that the 180A (under most normal circumstances) when used in either the AM or SSB modes. The notch filter on both sets is helpful. HOWEVER, THE NOTCH FILTER

OF THE 180A IS NOTICEABLY MORE EFFECTIVE THAN THAT OF THE 525. For this reason and probably due to the fact that the total system design of the 525 is radically different from the 180A + the Q Multiplier design, there were some band and signal conditions under which the 180A actually out performed the vaunted 525 + Collins arrangement!

Audio Quality:
Audio quality is not just a concern when doing relaxed shortwave listening. When the audio of a weak signal may already be distorted by poor transmission equipment and by having the signal bang around the turbulent ionosphere on an almost random basis, I do not want to loose ANY intelligibility due to inadequate audio fidelity at the receiver.

The audio quality race was won hands down by the HQ 180A. The general audio quality of the 525 is not good. After much experimentation, the author found that only the $60 matching NRD headphones delivered the most nearly-acceptable audio. Even going to those lengths to find the best advantage for the 525, audio from the HQ-180 was subjectively superior in all cases.

Stability:
The NRD-525 is absolutely rock stable. I don't know how they did it, but flip the thing on, set the frequency to the nearest 10 Hertz (as in 9553.07) and that is where this amazing receiver will be six hours later. Like most tube receivers, the HQ-180A wanders about plus or minus 500 Hertz as it heats up and then isn't too steady after that. On narrow filter settings, expect to tweak the tuning every five minutes or so. I found this drifting to be no problem at all, as I am very much a "hands-on" DX'er. However, a DX'er planning to do a lot of "hands off" timed recordings off the air would have some difficulty with the 180A.

Automation and Memories:
Truly, these capabilities are the major reason one might choose the much more expensive 525 rather that the highly modified HQ-180A. Having 200 memories which each capture frequency, reception mode, filter configuration and AGC setting is almost like having 200 radios! The 525 invites us to create entirely new operating patterns for more effective DXing. The HQ has no automation and the only memory available is that which is between the ears of the DX'er.

FINAL WORD:
You cannot purchase the NRD-525 as discussed here for less than about $1600 - the additional cost is that of a minimum of two Collins mechanical filters. Without the Collins filters or something nearly like them, the modified HQ-180A would win the selectivity contest every time.

It is possible to get the 180A as configured here for considerably less than the author paid since the author paid a premium for an almost museum quality 180, and purchased the Q-Multiplier and the new digital readout separately. Although good 180's are getting very hard to find and the price is going back up, a good 180 with Q Multiplier and digital readout already aboard can probably be had for $400 in an uncertain condition. If you are technically adroit DX'er, you can probably do most of the modification and reconstruction that Steve Bohac did for me in 1987 for under $50. Is the automation, stability and very slight increase in weak signal "hearibility" worth almost $1200?? I don't think so. However, if money is no object, I'd get the 525. It is a better radio.... but not by much.

A REVIEW OF THE R•390A RECEIVER

JOHN R. TOW
WITH KEVIN ATKINS

The R390A is a multiple conversion superhetrodyne receiver covering 0.5 - 32 MHz in 1 MHz increments except for the 0.5 -1.0 MHz range. It was designed for reception of CW, MCW, and AM transmissions with the capability of receiving SSB via an external adapter. It was designed to be used simultaneously with several transmitter/antenna combinations in a communications station type setting.

The R390A has antenna inputs to service a balanced two wire antenna as well as a high impedance single wire whip or random wire antenna. Audio output is via a front panel high impedance headphone jack and a 600 Ohm 0.6 Watt back panel screw terminal that comprises the Local AF channel. A Line AF channel also exists that places 60 mW on either a 150 or 600 Ohm balanced line on the back panel. The Line level is monitored by a VU meter. Other back panel connections include 455 KHz IF output, AGC, RF gain control, detector output, and break-in.

The front panel adjustments permit a wide range of listening options to be employed. The loading effect of the antenna can be compensated through the use of an antenna trimmer control on the front panel. Tuned frequency is determined by the position of the MHz knob (one MHz per increment) and the KHz knob (continuously variable from 000.0 - 999.9 kHz calibrations). Selectivity is step adjustable to 0.1, 1.0, 2.0, 4.0, 8.0, & 16.0 KHz. AGC response is defeatable and step adjusted to slow-medium-fast AGC. RF gain is front panel adjustable with the overall IF gain determined by an internal adjustment. The previously mentioned Local and Line AF channels have independent front panel gain adjustments. Audio filtering for CW or MCW reception is available via a front panel Wide/Sharp switch.

The R390A can be used for both critical SWLing and hardcore DXing. The range of AGC time constants and defeat permits its tailoring to fit a wide range of propagation conditions, from rapid flutter fading typical of polar path SW signals to the slow fading typical of MW signals. The MGC (AGC off) position offers the greatest sensitivity, albeit at the expense of a propensity to overload.

The excellent selectivity of this receiver, with it near hi fi quality when using the 8 or 16 kHz bandwidth or its band slicing ability with the 2 or 4 kHz bandwidths, is beyond compare. DXers weened on receivers like the Icoms or even the NRD-515 with their bassy, distorted audio will undoubtedly be shocked by the crystal clear sound coming from a good speaker properly matched to the R390A's Local audio output. The audio selectivity can be sharpened to the point of ringing for improved CW or MCW reception when the audio Wide/Narrow switch is in the narrow position. The R-390A receiver becomes one of the most selective CW receivers available when both the Narrow audio filter and the 0.1 kHz selectivity is employed.

The sensitivity of this receiver is actually adjustable. That is, the overall gain of the IF amplifier stages is adjustable by an internal potentiometer. Fortunately, this potentiometer is located on the topside of the IF module and is both easily accessible and well marked. Unfortunately, highest gain brings with it greatest background noise. With my receiver as an example, the IF gain can be reduced to lower the background noise and still yield a sensitivity better than my Icom R-70's without its pre-amp. The background noise is relatively low in level, especially in comparison to the levels present in today's modern receiver's "synthesized" front ends. Only a minor amount of background 120 Hz power supply hum is perceptible in low impedance headphones at minimum audio level, no doubt partially due to poor impedance matching and partially due to old power supply filter capacitors.

The R390A was used by the military for the reception of AM, CW, MCW, and FSK (RTTY). SSB reception is possible, although the receiver is not designed for it and thus, offers poor SSB performance. An outboard SSB adapter was used by the military to improve the SSB performance to fair. This converter hetrodyned the 455 kHz IF output down to an even lower frequency, around 20 kHz, I think, where it was filtered by an LC bandpass filter and fed to a ring type product detector. The receiver was simply designed as an AM/CW/MCW/FSK receiver and had too much RF gain for effective conversion to SSB.

Many installations used two or more receivers tuned to the same frequency but fed by different polarization antennas in a diversity reception system. The AGC lines and audio outputs would be essentially paralleled to give the benefit of the better of the two signals at any given instance. The receivers were designed for use in the proximity of operating transmitters with little desensitizing, ie reduction of sensitivity due to RF overload, permitted.

The R390A makes an excellent SWL receiver - within reason. The wide selectivity makes extremely comfortable clear signal reception possible. A connection from the diode detector to an external hi fidelity audio amplifier allows greater freedom in adjusting the audio power level and response and can be effected via a back panel connection.

Band scanning is a bit of a problem, but not nearly as great as band hopping! Changing from the lower reaches of 49 meters to the upper reaches of 25 meters requires two revolutions of the MHz knob (large amount of torque required) and nine turns of the kHz knob (3 MHz/rev and 100 kHz/rev respectively). Frequency readout and variations in linearity force frequent recalibrating to retain accuracy to the 100 Hz mark. As the Permeability Tuned Oscillator (PTO) ages, or more exactly, as the tuning slug's core ages, the linearity of the variable oscillator suffers. In addition, slight differences in the first conversion oscillator's crystal's frequencies require the recalibration of the dial when changing from one MHz band to another. The "S" meter is actually linearly calibrated in 20 db increments from 0 - 100 db in lieu of S1 - S9 +40 db as is common in other receivers.

The R390A comes into its own as a SWBC DXer's receiver. The 4kHz bandwidth seems optimal for all but the most critical of hairsplitting. When signals are closer than 5 kHz apart, the 2 kHz selectivity can be helpful. It has to be since exalted carrier reception is not available. The absence of a tunable IF notch filter like the Icom R70, R71A, Drake receivers, etc, can be most upsetting in the tropical bands. It can be somewhat remedied by the use of an audio notch filter (Autek QF1A, MFJ filters, etc.). An IF type "Q" multiplier, like the Heathkit QF-1, HD-11, or GD-125, would require some internal modification to connect to the appropriate place in the IF strip. If connected ahead of the mechanical filters, and the appropriate place for the Q multiplier is ahead of the selectivity determining components, then the mechanical filters could possibly be damaged when the Q multiplier went into oscillation!

The IF output located on the back panel of the R390A permits external detectors to be utilized. Such detectors could include AM synchronous types, FM detectors, and SSB/CW product detectors. I have a synchronous detector using a hard-to-find Signetics NE-561B PLL integrated circuit that I have used for nearly thirteen years which I normally plug into the IF output. This detector is routed through a high fidelity amplifier to a wide range speaker for casual listening to strong, low QRM, stations. The synchronous detector really does improve reception fidelity and reduces the distortion normally associated with selective sideband fading. In addition, external AGC circuits characterized for SSB and/or CW can be easily connected via the back panel to the internal AGC lines. If building electronic circuits is not your thing, then the Sherwood SE-3 detector could be connected very easily to the IF output for synchronous detection, permitting exalted carrier reception.

MW DXers require a strange mix in their receivers. High level signal handling capability is paramount in a good receiver. Excellent shielding is also required, especially when a well balanced loop antenna is to be used. The R390A is unsurpassed in both regards. It also is most useful in splitting 9 and 10 kHz channel spacings with its extremely steep skirted IF selectivity. I fully expect to hear the new Nevis Island MWer on 895 kHz when the QRN drops in the fall-winter, despite powerhouse WLS 890 and local WATV 900 (Kahn stereo).

The receiver suffers from the absence of the aforementioned IF notch filter as well as its tuning anomalies. To go from 960 kHz to 1030 kHz requires some ten turns of the kHz knob, no mean feat when in a hurry! An external audio 5, 9, and/or 10 kHz 'whistle' filter could be connected via the back panel to improve the audio quality.

One cannot overlook the attraction that a "hollow state" device has. Vacuum tubes, with their warm alluring glow, seem to attract quite a following these days. The R390A is, in my opinion, the finest example of a tube type receiver. It has 24 little glowing bottles within. Quite nostalgic. It also makes a dandy space heater!

Why ever would one use a boat anchor like the R390A when there are NRD's and Icoms about? Two main reasons come to mind: operational advantages and price.

I have owned and operated many receivers over the last twenty-five years or so, including Drake 2B, R-4C, SPR-4, Kenwood R-1000 and 2000, Yaesu FRG-7 and FR-101, Hallicrafters SX-111 and SX-115, Collins 51J3 and 75A4, and Icom R-70 and R-71A to name a few. None of these compare with the R-390A in terms of overall performance.

One particular problem that this receiver circumvents is that of intermodulation and cross modulation distortion products in the front end. This is a direct result of its military heritage. High level input signals do not overdrive its front end. Those strong evening signals in the 49 meter band that sometimes produce IM products above the 49 mb (all the way up to the 19 mb) in most of the modern receivers I've used offer little if any challenge to the R390A's front end. Simply stated, if a signal is detected on this receiver, it came in from the antenna!

The availability and price of the R390A is another strong suite. They became available in limited quantities in the late 60's at $1,000 - $2,000 for new surplus. Today one can be purchased in fair shape for as little as $100, about $1.33/lb.

The main reason that the receiver commands so little respect in today's surplus market revolves around the earlier stated ommission of a product detector for SSB/CW reception. Another detriment is the need for service and/or alignment. In addition, its size, weight, and power requirement are somewhat limiting as well. One man's junk is another man's DX rig!

Okay, I want an R390A ... where can I find one, you might say. Currently there appears to be two obvious sources: hamfests and surplus dealers. Many radio amateurs have tried to use the old receiver over the years on SSB or CW with poor results. Their best outlet for such a "boat anchor" has always been the flea market sales at the local hamfest.

All radio hobbyists need to attend a hamfest if possible. You can purchase anything from antenna wire to old WRTH's at such a gathering. Most areas of the country have one or more hamfests or ham-conventions during the course of a season (April -October). They are generally held in convention centers, auditoriums, malls, or small parks. The minimal requirement is simply an area where hams, etc. can back up their cars and sell their 'junque' from their respective trunks and compare stories of band pile-ups, QSL card hunting, awards collecting, etc. At the opposite end of the spectrum is the hamfest-convention with its collection of new equipment dealers, forums, and license examinations. Generally, the latter type of hamfest is held in an air conditioned space with more overhead for the vendors and an admission charge for the visitors. The Birminghamfest this year will charge $10 per table/day for the flea market and at least $6 admission. The Huntsville hamfest is generally free admission. Atlanta is more expensive than Birmingham, etc.

Now, you're in a 'hamfest' ... so what? Look for an R390A -it'll probably be on the floor or the end of the table with other goodies stacked on it. Be careful, the R390 looks very much like the R390A. You must insist on the A version. It has a selectivity control on the upper left hand side with 0.1,1.0,2,4,8,16 kHz positions. Look for the manufacturer's nameplate. Collins is undoubtedly the best with Motorola a distant second. The other manufacturers were not quite as good in my book, although they all had to meet the same specifications.

Cosmetic appearance is important. A rough looking set has probably seen a rough life - avoid it. Check the kHZ and MHz knobs for looseness. Watch the gears (the receivers are hardly ever found in cases) as the aforementioned knobs are rotated. The gears, cams, and slug racks should be there and move freely with no binding. Turn it over (Ugh, it is heavy!) and look towards the left side rear of the power supply chassis. You should see two empty 26Z5 tube sockets indicating that the tube type rectifiers were replaced by solid state devices, a field change made in the 1960's. Try the receiver out if at all possible. Place the function switch in the 'CAL' position and try to tune in one of the 100 kHz calibrator signals. Peak the antenna trimmer control and read the carrier level meter. It should read 35 - 60 db depending on the MHz knob position, with the higher levels at the lower frequencies. If all is okay at this point, start your haggling. Try to get a manual with the receiver. A good R390A will probably cost from $100 to $350 depending on the hamfest and the radio's condition.

Another source for the R390A is a reputable surplus dealer, such as John Meshna in Lynn, Mass. and Fair Radio Sales in Lima, Ohio. Expect to pay $200 plus depending on condition (generally sold 'as-is', 'used-repairable', or 'operating'). Current surplus stock is sold without the panel meters because of the Radium dials in the original meters. Try to get meters with the receiver as well as a manual and an exchange guarantee if defective. The receiver will be shipped UPS in at least two boxes because of its weight, so plan on some assembly. You'll need a long shank Phillips head screwdriver and a truss!

Now I own a boat anchor - how can I insure its longevity? Keep the cams clean of dirt and grime yet well lubricated. The slug tuning rack's bearing surfaces should also be cleanly lubed. Try to keep sawdust, cat hair, etc out of it's innards. Allow plenty of room for ventilation below, beside, and above the radio. Leave it on for extended periods rather than turning it off and on several times a day. They were designed for constant use. Enjoy it!

What kind of spares should I have, you might ask. Another receiver would be best. Spare vacuum tubes are a must. The radio has many duplicates, ie 5749/6BA6W, 5814, 6C4, 6AK6, etc. Singles, like the 6AK5, 6DC6, and 3TF7 current regulator should also be stocked. That last one is a bear to find! It might be easier to replace with a solid state voltage regulator, should it fail. The 3TF7 replacement has been the subject of several articles over the years with the best being the one available from the National Radio Club.

My receiver has been in my possession for over thirteen years with only a microphonic 6DC6 RF amplifier, open diode load choke, and broken coupling (I over tightened it!) as failures -and all of those were in the radio's first year of my use! What do you do if it does need servicing? Find a 'hollow state' enthusiast/repairman. It really is simple to troubleshoot, especially if you have the military manual with its step by step procedures for testing at hand. I would rate that manual, available from a number of surplus sources, as the #1 spare!

An especially good source of information on the R390A and its maintenance is the Hollow State News, a quarterly available from Chris Hansen, Box 1226, NY,NY 10159. The National Radio Club also has printed a number of R390A articles. Both of these resources have addressed the 3TF7 tube replacement, receiver alignment, PTO non-linearity, etc. Additional resources, such as Ham Radio, QST, 73, etc can be checked for information concerning the R390A and other Collins receivers. As an example, an article in Ham Radio nearly 18 years ago addressed the non-linearity aging problem in other Collins PTO's.

I have included my measurements taken in my 'lab' on my equipment. (My lab also includes a complete woodshop, metal shop, auto shop, electronic junk collection, and laundry facilities.) I have tried to be as fair as possible with my measurements. Keep in mind that my radio, a Collins, has not been aligned in years! Maybe ten, in fact!! The comparison I've made with my R70 was most interesting, indeed. The old radio just sounds better than the Icom, even when comparing the R390A on 4 kHz to the R70 on wide (6 kHz BW). Unfortunately, I could not obtain another signal generator to compare IMD and cross modulation products correctly. Let it suffice to say: I have never heard an internally generated signal on the R390A. For the rest, let the spec's speak! (See Table 1.)

How does the old boat anchor work, you might say. Well, mine works pretty damn well !!!! Seriously, it is a triple/double conversion superhet with 455 kHz mechanical filters in the final IF. It is double conversion above 8 MHz and triple below. The first variable IF, used only below 8 MHz, is gang tuned from 17.5 - 25 MHz when the radio is tuned from 0.5 - 8 MHz. It is then translated to the second variable IF along with the 8 - 32 MHz signals. The second IF tunes from 2 - 3 MHz and is gang tuned with the kHz and MHz knob. This IF is mixed with the output of a highly linear permeability tuned variable oscillator (infamous Collins PTO). So far the signals have passed through a 6DC6 RF amplifier and two 6C4 triode mixers with a total of ten slug tuned and mechanically coupled tuned circuits. A stout and selective front end!

The Collins Permeability Tuned Oscillator is an extremely stable variable frequency oscillator whose output frequency is varied by rotating a shaft that advances a slug into or out of the oscillator's resonating inductance. The linearity of the PTO when new is much better than the variable capacitors found in many other analog designs. One turn is exactly 100 kHz variation for over ten consecutive turns. This permits the mechanical turns counter 'digital' display used on this receiver, a display whose frequency can be read to 0.2 kHz. Drake also used the PTO type design along with permeability tuned front end circuits as well.

The first local oscillator uses a 17 MHz quartz crystal while the second oscillator switch selects one of 15 crystals depending on the MHz switch position. Band changes thusly can result in a slight calibration shift since the crystals cannot be "rubbered" on frequency. This recalibration can be effected by using the internal 100 kHz calibrator circuit. The procedure is simple: Turn the receiver to Cal, thus turning on the 100 kHz calibrator. Set the selectivity to 0.1 kHz and the BFO to 12:00. Tune the kHz knob to the nearest 100 kHz position. Turn the Zero Adjust knob CW to lock the readout in place. Adjust the kHz knob to maximize the Carrier Meter reading and simultaneously zero beat the BFO if it is in proper alignment (If it isn't, you can simply loosen the shaft and adjust it if you have the proper Bristol wrench, so that zerobeat occurs with the BFO Pitch at 12:00.). Loosen the Zero Adjust knob by turning it CCW and you are ready to go.

The third IF is at 455 kHz and consists of a half lattice crystal filter that can provide either 0.1 or 1 kHz selectivity followed by a 5749/6BA6W IF amplifier whose gain is set along with the RF amplifier by the RF gain control. This amplifier is in turn followed by a choice of 2, 4, 8, or 16 kHz Collins Mechanical filters with the 2 kHz filter automatically following the 0.1 or 1 kHz selectivities. The half lattice crystal filter is bypassed when using the 2 - 16 kHz selectivity. A few words concerning those infamous Collins mechanical filters are in order.

A mechanical filter is actually a very simple device. It consists of two separate coils physically coupled by a thin rod or wire. The wire is made to vibrate by passing an alternating current through the input coil. This vibration is coupled to aluminum discs calibrated to mechanically resonate at the desired IF frequency. (This mechanical vibration requirement limits the highest frequency of operation for mechanical filyers to less than 1 MHz.) The output coil generates a minute alternating current as the oposite end of the rod vibrates within its core. The selectivity and shape factor are determined by the size of the inter-disc coupling rods or wires. Greatest efficiency as far as coupling is concerned occurs when both the input and output coils are electrically resonated and properly matched for impedance. Generally, In/Out impedances range from 3 - 10 kOhms, shape factors are less than 2.0:1, and ultimate rejection exceeds 100 db. Unfortunately, loss generally runs 6 - 12 db. Loss can be minimized by resonating the transducer coils to the center frequency by placing trimmer capacitors across each coil and properly peaking them. These capacitors were retrofitted to many of the earlier runs of R-390As, and standard on later runs. Check the square cover over the mechanical filters on the back of the IF strip, just in front of the back panel IF output jack, for four holes with screwdriver slot abjustments (trimmer capacitors) within. If present, your receiver has the trimmer modification.

The physical layout of the R390A is largely responsible for its tremendous skirt selectivity. A good quality mechanical fiter would not, for example, exhibit its ultimate rejection when used in a receiver where it was mounted on a large motherboard such as the Icom employs. Neither would it be as useful on a plug-in board in close proximity to other circuits. Simply stated, in most modern applications, too much signal can "leak" around a good filter because of poor layout design. The R390A has tremendous isolation! The mechanical filters pass through a metal chassis with a cover over the tops of the filter. The straight line signal paths and totally enclosed (shielded) circuit sub-assemblies exemplified by this receiver are responsible for its excellent selectivity, both in the RF ciruitry and the IF circuitry. These design philosophies dictate larger, more complex assemblies. This type of design would be cost prohibitive today.

The filters are in turn followed by another IF amplifier whose gain is adjusted by the front panel RF gain control, a third IF amplifier whose gain is adjustable internally, and a fourth and final amplifier. The IF amplifiers are stagger tuned and/or have swamping resistors placed across their windings to spoil their "Q". All of this is to provide the wide but very flat 16 kHz bandwidth, hence the lower gain per stage and larger number of stages required. Some used receivers, generally 'converted' by a well meaning amateur, have had the IFs retuned and, in some cases, have even had the swamping resistors removed, resulting in very tight selectivity and too much gain.

The last IF amplifier is followed by a diode type AM detector, AGC amplifier, detector, and AGC time constant circuitry. The diode detector is followed by a full wave diode noise limiter (useless - and by passed in my radio!), a selectable 800 Hz audio filter (for CW), and both a local and a line level audio amplifier, the latter including a calibrated VU meter. The audio is available via the front panel headphone jack or the local 600 Ohm output on the back. As stated previously, a whopping 0.6 W is available. The balanced line output is available at 600/150 Ohms with 60 mW output also on the back panel.

The AM only diode detector is augmented by a well calibrated tunable Beat Frequency Oscillator for CW and/or SSB reception. The half wave diode detector is a poor substitute for a product detector and thus CW/SSB reception is suboptimal. Since the detector overloads with the BFO signal and a strong received signal, one should set the receiver on manual gain control (MGC) with the AF gain at maximum and the level adjusted by the RF gain control. Reception is still well below par on SSB and CW. An AM receiver, indeed!!

I traded a Drake 2B with a homebrew digital display and $60 for my Collins R390A to a ham at a hamfest flea market over thirteen years ago. I had been trying to find an R390A I could afford for years, especially since I attended a U.S. Navy E.T. school on the radio in '69. When I purchased the radio I had just graduated from Auburn with a BS in Physics and was unemployed and living with my wife, two sons, and Harriet (our pregnant 4 yr old tabby) at my mother-in-law's house. The radio was in a metal modern Bud cabinet and Harriet began a career of reposing atop the warm radio. With a pair of headphones I could drown out my mother-in-law's incessant "Why don't you go out and get a job?" diatribes.

The electrical interference was nearly as bad as the QRM-in-law, so I finally did get a job as director of field engineering at a small computer company and we moved into a large apartment complex. Reception was quite good at that location, but I wanted more of an antenna farm. I bought my current house a year or so later. I couldn't take the computer job, after all, I might really make some money! I started teaching full-time in the fall of '75.

I used the R390A as my main receiver for eight years. Only after acquiring my R70 did it fall to the second echelon. As I have previously stated, I have owned many radios over the years. I would be hard pressed to exist without my easier-to-band-scan (yes, I have even 'list-logged' a few stations in my days!) Icom, but if allowed only one radio, it would still have to be the Collins R-390A. Of course, I'd have to have my spares and a good source of power, even if stuck alone on the proverbial desert isle. I'd probably still have power line interference. It follows me everywhere. It must be my electromagnetic personality.

How do I use my R-390A? Sometimes I don't use it! In fact, I just recovered it from my darkroom after a hiatus of several months due to my temporary DXing burnout. My desk was under a great deal less of a strain without the old creceiver (Ha! It oughta be glad I'm not sitting on it!), but it does look much better with the hollow state behomoth on it! Unfortunately, I missed Ramadan and the extended hours of operation of all of those rare Indos. No doubt those rare 120 & 90 mb PNG's have already dropped off as well. Oh well, I'll probably even miss that opening to Tristan da Cunha and even Nibi Nibi as well!

When DXing, I generally use the radio as follows; General band conditions, WWV propagation reports, DX programs, etc are monitored on either my Sangean '803 or my Uniden '2021. Specific DXing requires the use of the R70 and its tiring audio until a signal is heard 'in the noise' or undetectable because of adjacent channel QRM. Now it is time for the large caliber artillery, the R-390A.

The R-390A's superb selectivity allows channel splits, even on MW, to come roaring through. I always start on 4 kHz and occasionally move to 2 kHz. The diode detector does introduce distortion when offset tuning a sideband with the 2 kHz filter, but sometimes it is necessary. Generally, an in-the-noise signal on another radio will have a slightly improved signal to noise ratio on the R-390A and will be more intelligible on it. The audio is much cleaner as well, making reception of difficult signals much less tiring than with the Icom.

I placed a 10 k and a 1 kOhm resistor in series across the diode load terminals with the lower value grounded. An audio patch cord is wired across the 1 kOhm resistor (shield grounded) and fed to the input of a 5 band equalizer with the output fed to an amplifier and tape deck for monitoring and recording. With the other channel of the stereo equalizer, amp, and cassette recorder connected to my Icom, I would generally DX 'in stereo'. Feeding the receivers from different antennas gave me a crude form of diversity reception, a definite aid to weak signal DXing, as the old brain is fooled into disregarding some of the QRM and QRN by the 'stereo' effect. For most of my better 'catches', I switch over to the R-390A. In fact, my QSLs from FIBS, Cook Is, Solomon Is, Kiribati, CKFX, etc, were all results of my R-390A loggings made while the R70 resided by its side!! The external audio help is definitely a boon to DXing. Continuously recording a listening session on cassette tape via an inexpensive stereo cassette recorder on inexpensive C-60 tapes is also a big help, as you can replay that elusive ID as much as you want. Amazing how the old gray matter can turn "crzzzzz snap pop crxx crackle" into that wanted ID!

The R-390A can be used in a true space diversity reception system at quite a reasonable cost. Two receivers, each being fed from a different antenna, can be matched in gain by the adjustable IF gain, have their AGC/DIV lines connected together to 'track' with the better signal, and either have their audios combined or fed as 'stereo' to the listener. The sets were designed with this as an option. You could, of course, try the same thing with two NRD-525s at a bit higher cost.

How about other, less fanatical R-390A nuts, how do they use the radio? Let me introduce my good friend, even if he has a QSL from Sierra Leone, the first SWL/DXer I have ever met, Kevin Atkins. Kevin's a super sleuth DXer. I am often in awe of his ability to follow the gray line and catch those rare and exotic South Pacific goodies. Kevin's day begins at 4:00 AM CST as he tries to catch the gray line goodies. I often yawn at his recounted catches! Kevin's shack includes the R390A, R70, and CR-2021. Witness a few of Kevin Atkin's comments on the radio:

WHY I LOVE MY R390A

KEVIN ATKINS

After several marginally successful attempts to log Malawi during the 0345-0400 window on my R70, I finally got tired of Chinese music from Okeechobee and Soviet slop from Havana. I love my Icom, too, but on 49 mb after dark I'd just as soon use a Star Roamer. (I guess I'm a little overly sensitive, if you will, after having owned a DX-300 a few years ago.) An R390A does not overload. Period. If you hear it, it's there. This receiver was designed for use in close proximity to point to point transmitters. You sometimes get splatter, but you don't get overloading. You guessed it - I got Malawi!

Advantages over modern receivers:

- Practically immune to overloading
- Excellent AM selectivity: .1, 1, 2 (with this filter you don't miss exalted carrier SSB too much), 4, 8, & 16 kHz
- A quality of audio rarely found in conjunction with such selectivity
- Probably the most accurate frequency readout ever produced in the pre-synthesizer era ... a mechanical digital readout in conjunction with the 100 kHz calibrator. Readout to within +/- 200 Hz is possible with practice.

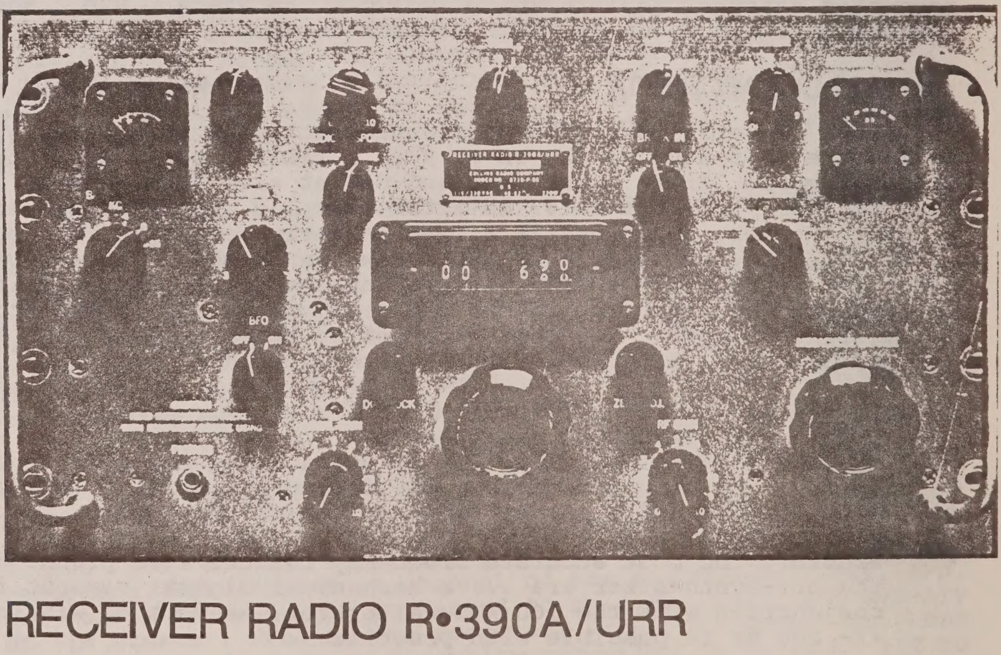
Disadvantages:

- You'll need a B & D Workmate to hold it. In a metal case, it weighs over 90#.

* Cumbersome to tune. You could hurt yourself trying to go from 3215 to 4995 too quickly.
* Uses BFO for sideband reception. ECSSB not possible.
* It's hard to believe the lack of a notch filter on a receiver of this caliber.
* No nifty memory presets or dual VFO's - it tunes one signal at a time, does it extremely well, then moves on. (not by itself! JRT)
* You won't find many people who'll work on it.

Postscript by John Tow

My R390A may reside in my darkroom for several months out of the year, but when it comes time to seriously listen or DX, out it comes. I have found it to be an excellent test bed for new detectors, a tool for evaluating new antennas and tuners, and a warm spot for poor old arthritic Harriet, my DX kitty, to curl up on!



RECEIVER RADIO R•390A/URR

Table 1

R390A VERSUS R-70

JRT 3/88

Signal Generator = URM-25D
30 % AM modulated by 1 kHz sinusoid

	R-390A		R-70 (w.preamp/w.o.preamp)	
(S+N)/N	10 db	15 db	10db	15 db
MHz	Generator Signal Strength in microvolts			
0.900	1.00	3.00	0.30/1.00	0.60/2.00
4.900	0.45	0.95	0.22/0.53	0.52/1.00
15.400	0.40	0.90	0.27/1.00	0.50/1.50
29.400	1.00	5.00	0.40/0.72	0.73/1.20
0.200	----	----	2.30/0.95	4.00/1.60

(R390A Bal Ant input connected unbalanced to 50 Ohm source.)

CW sensitivity
R-390A with 0.1 kHz IF selectivity, MGC, Narrow AF filter:
0.06 microvolts for 10 db (S+N)/N
R-70 with narrow CW filter (0.500 kHz)
0.07 microVolts for 10 db (S+N)/N

Selectivity

Receiver	R-390A				R-70 (modified)	
Setting	2.0	4.0	8.0	16.0	Wide	Narrow (FL-44A)
BW @ -60db	3.8	6.9	15.8	22.7	10.0	3.1 kHz

Carrier Meter (4.900 MHz)

R-390A	20 db	40 db	60 db	80 db	100 db	(reading)
	7.5	27	130	1,600	30,000	(microvolts)

S Meter (4.900 MHz)

R-70	S1	S3	S6	S9	20db/S9	40db/S9	(reading)
	1.8	4.0	16	100	950	10,000	(microvolts)

Drift:
R-390A From 1 - 30th minute fron cold start < 0.2 kHz

R-70 Unmeasurable

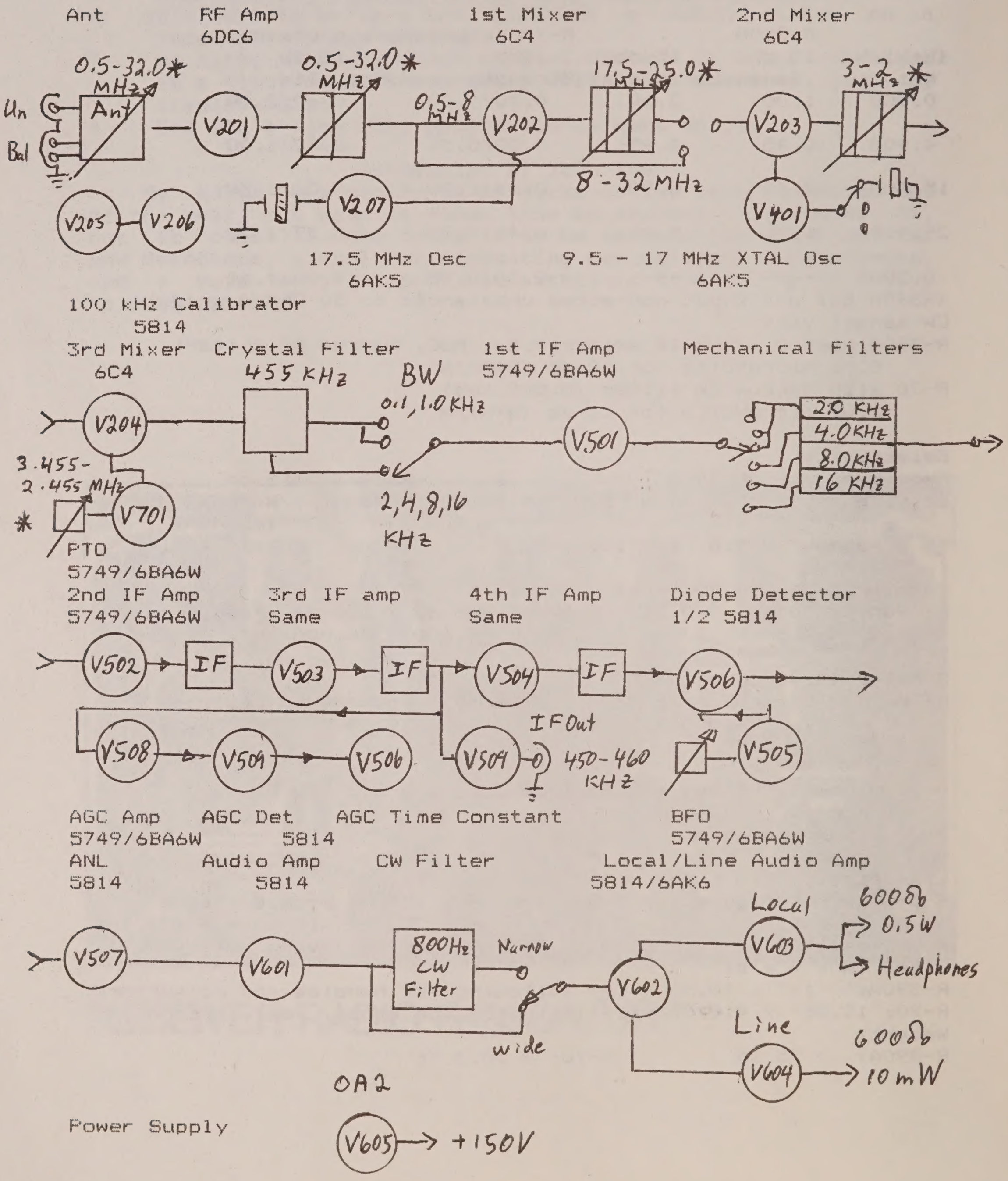
Linearity:
R-390A with calibration @ 500 kHz: +/- 600 Hz from extremes
+/- 200 Hz within +/- 100 kHz

A.C. Power: R-70: 18 VA R-390A: 200 VA (ovens off)

Size: (W x H x D)
R-390A: 19" x 10.5" x 18" (allowing for handles and connectors)
R-70: 11.25" x 4.875" x 14"(allowing for knobs, feet, & conn.)

Weight:
R-390A: > 75 lb R-70: ~ 10.3 lb

R390A BLOCK DIAGRAM


Ant
RF Amp
6DC6
1st Mixer
6C4
2nd Mixer
6C4
0.5-32.0* MHz
Ant
Un
Bal
V201
0.5-32.0* MHz
0.5-8 MHz
V202
17.5-25.0* MHz
8-32 MHz
V203
3-2* MHz
V401
V205
V206
V207
17.5 MHz Osc
6AK5
9.5 - 17 MHz XTAL Osc
6AK5
100 kHz Calibrator
5814
3rd Mixer
6C4
Crystal Filter
455 KHz
BW
1st IF Amp
5749/6BA6W
Mechanical Filters
0.1, 1.0 KHz
V204
V501
2.0 KHz
4.0 KHz
8.0 KHz
16 KHz
3.455-2.455 MHz
*
V701
2,4,8,16 KHz
PTO
5749/6BA6W
2nd IF Amp
5749/6BA6W
3rd IF amp
Same
4th IF Amp
Same
Diode Detector
1/2 5814
V502
IF
V503
IF
V504
IF
V506
IF Out
V508
V509
V506
V509
450-460 KHz
V505
AGC Amp
5749/6BA6W
AGC Det
5814
AGC Time Constant
BFO
5749/6BA6W
ANL
5814
Audio Amp
5814
CW Filter
Local/Line Audio Amp
5814/6AK6
Local
600Ω
0.5W
V507
V601
800Hz CW Filter
Narrow
V602
V603
Headphones
wide
Line
600Ω
V604
10mW
OA2
Power Supply
V605
+150V

* Mechanically Tracking KHz and MHz Knobs

ONCE A GOOD RECEIVER, ALWAYS A GOOD RECEIVER

THE DRAKE R7 COMMUNICATIONS RECEIVER REVISITED

JERRY STRAWMAN

The Drake R7 Receiver became widely available in late 1979. In many ways, this receiver was a perpetuation of a line of receivers designed for the radio amateur. The first receiver appeared in 1959. The following table traces the lineage of the Drake R7:

Drake 1-A	c. 1959	Drake SW-4A	c. 1967
2-A	c. 1960	R-4B	c. 1968
2-B	c. 1962	SPR-4	c. 1970
R-4	c. 1965	DSR-1	c. 1971
R-4A	c. 1967	R-4C	c. 73-74
2-C	c. 1967	DSR-2	c. 75-76

Not included in this list is the Drake SSR-1 of the late 1970's. Drake made a mistake in having the receiver produced for them in the Far East. The receiver was regarded as a disaster. In recent years I have observed examples of all of these Drake receivers, with the exception of the DSR models, offered for sale at Amateur gatherings, equipment sales listings, and hobby publications. The continued interest on the part of radio enthusiasts points to the quality and utility of these fine receivers.

The Drake R7 originally was produced with an analog dial, and like most of its predecessors, provided coverage of the amateur bands only. Several months later, Drake offered a R7/DR7 version, which had a digital dial and 0-30 mHz coverage. The R7/DR7 became to be known simply as the R7, and was priced in the \$1200-\$1300 range. It was offered with one crystal lattice filter measuring 2.3 kHz at the 6 dB point. Optional accessories included an MS7 speaker, 300, 500, 1800, 4000, and 6000 Hz filters, the NB7A noise blanker, Aux7 Range Program/Fixed-Frequency Board, the R7 Service/Schematic Manual, RP700 receiver protector, and a LA7 Line Amplifier. In the months when it was last offered new, shortwave hobby havens such as Radio West and Gilfer Shortwave sold the receiver for \$1650 to \$1700 with the buyer's choice of four filters. These dealers made available filters from Drake and from Sherwood Engineering of Denver, Colorado.

Today, the R7 is available in used condition, but do not seem to to be in plentiful supply. Whether the supply of R7's has been set by their ceasing to exist, or they continue to remain in the hands of hobbyists, is not known to me. The current price one can expect to pay, is in the range of \$600 to \$900US, depending on condition and the number of installed accessories. Because the cost of an R7 approximates the current price for currently available receivers, one must ask whether it is worth the asking price, when a new receiver can be had for a similar price.

R7 SPECIFICATIONS

Frequency Coverage, continuous tuning 0.01 to 30.0 MHz

Plus any eight additional 500 kHz segments between 0 and 30 MHz when programmed into Aux7 Board.

Crystal Controlled Fixed Frequencies: Up to eight crystal-controlled fixed frequencies within the 0-30 MHz range with Aux7 Accessory Board. Proper 500 kHz range for desired fixed frequency is also programmed into Aux7.

Frequency Stability: Less than 1 kHz first hour. Less than 150 Hz per hour after 1 hour warm up. Less than 100 Hz for ± 10% line voltage change.

Digital Readout Accuracy: (DR-7 installed) 15 PPM ± 100 Hz

Analog Dial Accuracy: Better than ±1 kHz when calibrated to nearest calibrator marker.

Modes of Operation: Ssb, cw, RTTY, SSTV, a-m.

Sensitivity (ssb): 1.8-30 MHz Less than .20μV for 10dB (S+N)/N with preamp on (typically .15μV) (Noise floor typically −134 dBm) Less than .50μV for 10 dB (S+N)/N without preamp (typically .30μV) (Noise floor typically −128dBm). .01-1.5MHz Less than 1.0μV for 10 dB (S+N)/N

Sensitivity (a-m): 1.8-30MHz Less than 1.2μV for 10dB (S+N)/N @ 30% modulation, preamp on. Less than 2.0μV for 10 dB (S+N)/N @ 30% modulation, preamp off. .01-1.5 MHz Less than 4.0μV for 10 dB (S+N)/N @ 30% modulation.

Selectivity (2.3 kHz filter supplied): 2.3 kHz at −6 dB, 4.4 kHz at −60 dB (1.8:1) shape factor. Optional 300 Hz, 500 Hz, 1800 Hz, 4 kHz, and 6 kHz filters are available as follows:

Accessory Crystal Filters

SL-300 cw filter: 300 Hz @ 6 dB, 700 Hz @ 60 dB
SL-500 cw, RTTY Filter: 500 Hz @ 6 dB, 1100 Hz @ 60 dB
SL-1800 ssb/RTTY Filter: 1800 Hz @ 6 dB, 3600 Hz @ 60 dB
SL-4000 a-m Filter: 4 kHz @ 6 dB, 8 kHz @ 60 dB
SL-6000 a-m Filter: 6 kHz @ 6 dB, 12 kHz @ 60 dB

Ultimate Selectivity: Greater than 100 dB

Intermodulation:

Two-tone dynamic range: 99 dB *	1.8-30 MHz
Third order intercept point: +20 dBm	preamp off
Two-tone dynamic range: 95 dB *	1.8-30 MHz
Third order intercept point: +10 dBm	preamp on
Blocking: >145 dB above noise floor	

* *(at tone spacings of 100 kHz and greater)*

I-f and Image Rejection: Greater than 80 dB (48.05 MHz 1st i-f) (5.645 MHz 2nd i-f) (50 kHz 3rd i-f)

Agc Performance; Less than 4 dB audio output variation for 100 dB input signal change above agc threshold. Agc threshold is typical .8μV with preamp off and .25μV with preamp on.

Attack time: 1 millisecond. Three selectable release times: Slow—2 seconds; Med—400 m sec; Fast—75 m sec. Also, "Off" position is provided.

Antenna Input Impedance: Nominal 50 ohms

Audio Output: 2.5 watts with less than 10% T.H.D. into nominal 4 ohm load.

Power Requirements: 100/120/200/240 V-ac ±10%, 50/60 Hz, 60 watts or 11.0 to 16.0 V-dc (13.8 V-dc nominal), 3 amps

External Counter Mode (DR-7 installed): Readout: to 100 Hz. Accuracy: 15 PPM ±100 Hz. Maximum input frequency: 150 MHz. Input level range: 50 mV to 2 V rms.

Dimensions/Weight:

Depth—13.0 in (33.0 cm) excluding knobs and connectors.
Width— 13.6 in (34.6 cm)
Height— 4.6 in (11.6 cm) excluding feet
Weight— 18.4 lbs (8.34 kg)

The R.L.Drake Company, in its advertising, listed receiver specifications which are shown to the left. In the early 1980's Robert Sherwood, owner of Sherwood Engineering, Denver Colorado conducted extensive tests on receivers and transceivers of that time. The results of the testing that involved the Drake R7 showed that the receiver noise floor was -135dBm while the AGC threshold[the point below which audio falls off linearly with the signal] was measured at 0.4 uV. Due to the AGC action, the drop in audio-output level, as compared to a 5 mV signal, was 3 dB. Receiver blocking was found to be 145 dB. Receiver sensitivity was calculated at 0.28 uV without the preamplifier and 0.15 uV when the preamp was employed. Local oscillator noise was 114 dBc at 2 kHz spacing. Mr. Sherwood went on to grade receiver front end selectivity. Radios with a tracking preselector were assigned an A+ grade, while those that had no input selectivity were graded an F. He gave a B grade to the Drake R7. Filter ultimate rejection was shown to be 85 dB. An ultimate rejection of 120 dB would not show leakage until S9+60 dB. Wide dynamic range at a spacing of 100 kHz was 97 dB, while close dynamic range at 2 kHz was 75 dB.

What about receiver features? R.L. Drake literature summarizes the notable features of the R7 in a table at the right.

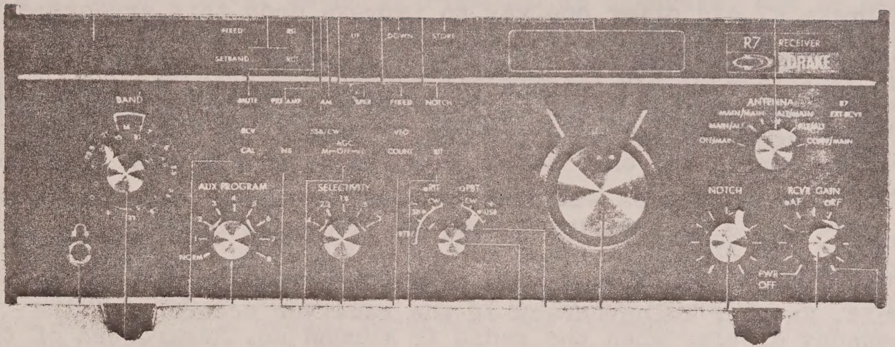
R7

Synthesized
General Coverage
Receiver

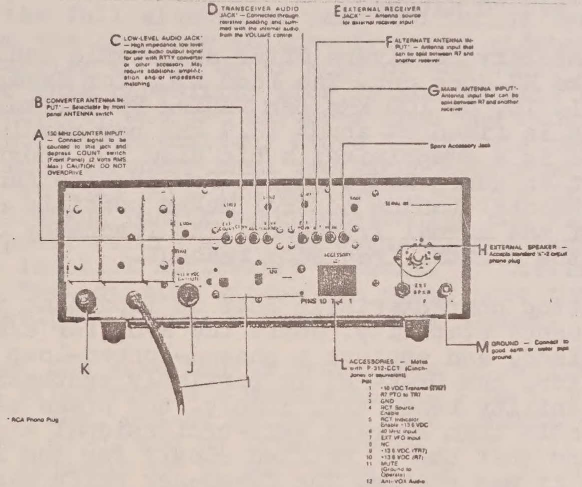
Full general coverage reception, 0-30 MHz, with no gaps or range crystals required.

Continuous tuning all the way from vlf thru hf. Superb state-of-the-art performance on a-m, ssb, RTTY, and cw—and it transceives with Drake TR7.

- **100% solid state broadband design, fully synthesized with** a permeability tuned oscillator (PTO) for smooth, continous tuning.
- **Covers the complete range 0 to 30 MHz** with no gaps in frequency coverage. Both digital and analog frequency readout.
- **Special front-end circuitry** employing the high level double balanced mixer and 48 MHz "up-converted" 1st i-f for superior general coverage, image rejection and strong signal handling performance.
- **Complete front-end bandpass filters** are included that operate from hf thru vlf. External vlf preselectors are not required.
- **10 dB pushbutton-controlled broadband preamp** can be activated on all ranges above 1.5 MHz. Low noise design.
- **Various optional selectivity filters** for cw, RTTY and a-m are switch-selected from the front panel. Ssb filter standard.
- **Special new low distortion "synchro-phase" a-m detector** provides superior international shortwave broadcast reception. This new technique permits 3 kHz a-m sideband response with the use of a 4 kHz filter for better interference rejection.
- **Tunable i-f notch filter** effectively reduces heterodyne interference from nearby stations.
- **The famous Drake full electronic passband tuning system** is employed, permitting the passband position to be adjusted for any selectivity filter. This is a great aid in interference rejection.
- **Three agc time constants plus "Off" are switch-selected** from the front panel.
- **Complete transceive/separate functions when used with the Drake TR7 transceiver are included, along with separate R7** R.I.T. control.
- **Special multi-function antenna selector/50 ohm splitter is** switch-selected from the front panel, and provides simultaneous dual receive with the TR7. This makes possible the reception of two different frequencies at the same time. Main and alternate antennas and vhf/uhf converters may also be selected with this switching network.
- **The digital readout of the R7 may be used as a 150 MHz** counter, and is switched from the front panel. Access thru rear panel connector.
- **The built-in power supply** operates from 100, 120, 200, 240 V-ac, 50/60 Hz, or nominal 13.8 V-dc.
- **The R7 includes a built-in speaker,** or an external Drake MS7 speaker may be used.
- **Built-in 25 kHz calibrator** for calibration of analog dial.
- **Low level audio output** for tape recorder.
- **Up to eight crystal controlled fixed channels can be selected.** (With Drake Aux7 installed.)
- **Optional Drake NB7A Noise Blanker available.** Provides true impulse type noise blanking performance.


FIXED
SETBAND
UP
DOWN
STORE
R7 RECEIVER
DRAKE
BAND
MUTE
PREAMP
AM
FIXED
NOTCH
ANTENNA
RCV
CAL
NB
SSB/CW
AGC
VFO
COUNT
AUX PROGRAM
NORM
SELECTIVITY
NOTCH
RCVR GAIN
AF
RF
PWR
OFF

The illustrations above and below, depict the various controls, control placement, and the various input and output connections.


D TRANSCEIVER AUDIO JACK* — Connected through resistive padding and summed with the internal audio from the VOLUME control
E EXTERNAL RECEIVER JACK* — Antenna source for external receiver input
C LOW-LEVEL AUDIO JACK* — High impedance, low level receiver audio output signal for use with RTTY converter or other accessory. May require additional amplification and/or impedance matching
F ALTERNATE ANTENNA INPUT* — Antenna input that can be split between R7 and another receiver
G MAIN ANTENNA INPUT* - Antenna input that can be split between R7 and another receiver
B CONVERTER ANTENNA INPUT* — Selectable by front panel ANTENNA switch
A 150 MHz COUNTER INPUT* — Connect signal to be counted to this jack and depress COUNT switch (Front Panel) (2 Volts RMS Max.) CAUTION: DO NOT OVERDRIVE
Spare Accessory Jack
H EXTERNAL SPEAKER — Accepts standard ¼"-2 circuit phone plug
M GROUND — Connect to good earth or water pipe ground
K
J
L ACCESSORIES — Mates with P-312-CCT (Cinch-Jones or equivalent)
PIN
1 +10 VDC Transmit (TR7)
2 R7 PTO to TR7
3 GND
4 RCT Source Enable
5 RCT Indicator Enable +13.6 VDC
6 40 MHz input
7 EXT VFO input
8 NC
9 +13.6 VDC (TR7)
10 +13.6 VDC (R7)
11 MUTE (Ground to Operate)
12 Anti-VOX Audio
PINS 10 7 4 1
EXT SPKR
ACCESSORY
SERIAL NO.
* RCA Phono Plug

So how does the Drake R7 play in the real world? My personal experience allows me to make some comparisons between the R7 and the Icom R70 receivers. Both receivers offer a cumbersome tuning arrangement. The Drake receiver divides the spectrum into 500 kHz sections, with some frequency "overtravel" at each end. The Icom unit has thirty 1 mHz segments in its coverage. In the case of the R70, there is a ham/general coverage switch. When the switch is placed in the ham mode, tuning is confined to within all current and planned ham bands. When in the general coverage mode, normal 0-30 mHz coverage is available. When ascending in frequency from xxxx9.9, continuing to rotate the tuning knob causes the display to change to xx00.0. When descending, the reverse holds true. Both receivers require the operator to use up and down push buttons to increment away to the next desired frequency, if not within the same frequency segment.

The Drake R7 did offer one way to improve upon this arrangement. The use of up to eight RRM-7 modules and a crystal installed adjacent to each module, allowed the operator to further select any specific frequency within the 500 kHz segment, as programmed by the RRM-7 module. These modules are encased diode arrays and are no longer available from Drake. I have never seen any offered for sale, and only heard of a few receivers with them installed.

Overall, the tuning system of the R7 is slower than those employed by the Kenwood R-1000 or JRC NRD 515, for example. The system makes rapid checks of parallel station frequencies difficult. Another idiosyncracy of the receiver occurs with the frequency display when the radio is turned on. Regardless of the bandswitch setting, the display comes up only at a predetermined point within an amateur radio band. Despite these quirks, I, a confirmed knob twiddler, found that the tuning procedures required became second nature.

Several contemporary receivers offer selectable tuning rates, while the Drake R7 does not. The Icom R70, for example allows selection of 1, 10, or 100 kHz per tuning knob revolution. The R7 tuning rate is fixed at about 12.7 kHz per revolution. I find this rate is a comprimise; a bit slow for shortwave tuning, and a bit fast in tunig SSB signals. For precise tuning, the receiver incremental tuning control makes possible excursions to either side of the signal frequency. The frequency change is displayed on the digital frequency readout.

Another operating characteristic that is important to receiver users is frequency stability. While the R70, for example, is fully synthesized, and employs a phased-locked-loop for its local oscillator, the Drake R7 is partially synthesized and features a permeability tuned VFO. Simply, the Drake receiver is a bit less stable than current semi-professional and professional radios. I found that the R7 drifted slowly for the first hour, at which time it was stable. The frequency drift was 250 Hz maximum, and at no time was a problem in reception of AM or SSB signals.

Two additional circuits employed in the Drake R7 were found to be similar in effectiveness, when compared to the Icom R70 and to other receivers I have owned and operated. The notch filter, while not so deep as certain older Drake and Collins receivers, will significantly reduce, if not eliminate, all but enormous heterodynes. The NB7A noise blanker, optional with the R7, and a standard feature for the subsequent R7A, is effective against Loran-type interference and against ignition pulse noise, such as produced by automobiles and lawn mowers. Its ability to reduce or eliminate the "Russian Woodpecker" was variable. Its effectiveness seemed to be determined by existing propagation conditions. One day it could be very effective, and less so the following day.

The R7 signal level meter is regarded as accurate, and is calibrated in "S" units and dB above S9. Steve Bohac reports that the meter action, in strong signal situations can be seen to jump in concert with modulation peaks, at BCB frequencies. He says that this results from variations in the AGC line not being obscured by rapid fading, as experienced at shortwave frequencies.

Two additional receiver features that are seldom encountered are: 1] An onboard 150 mHz frequency counter; 2] A three-way antenna selector and splitter control on the front panel. In addition to the separate antenna inputs, any two of the antenna choices may be switched over to a second receiver, or shared with the R7 and a second receiver. The assembly possesses an unusual degree of electrical isolation between the various inputs.

Perhaps the the most acclaimed function found in the Drake R7 receiver is the full electronic passband tuning system. Drake's system allows the operator to tune from one sideband, through the signal carrier to the outer edge of the other sideband. The importance of this capability lies in the ability to place the chosen "selectivity window" anywhere upon the radio signal. In a typical listening situation, Radio Marti, via the VOA, on 9590 kHz is much stronger than the Nihon Shortwave BC station on 9595 kHz, at 1345 UTC. The employment of the Exhalted Carrier Selectable Sideband tuning technique(tuning the signal as if it was a SSB signal) offers some improvement. Modulation splatter interference is still noticeably present. By utilizing the PBT control, the "selectivity window" is moved into the NSB upper sideband, leaving a clear, although weak, signal.

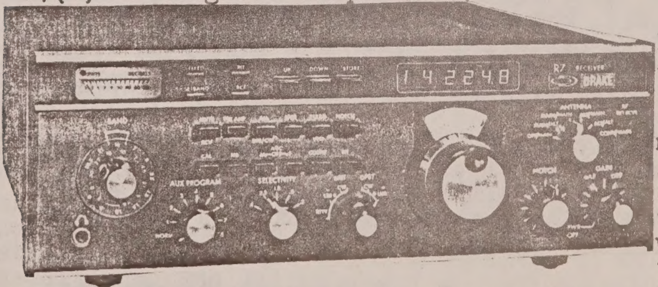
Application of the same tuning procedures in exploring tropical band signals often yields a usable signal from a jumbled mess. R. Reloj, 4832 kHz, can be extracted from interference caused by R. Tachira, 4830, and by interference from 4835 kHz. The CW interference adjacent to R. Sutatenza, 5095, the annoying pulsing interference plauging Unjung Pandang, 4719, the FEMA CW station that affects Bamako, Mali from 3 kHz away, and the enormous utility station that wipes out half of the La Voz de Nahuala signal on 3360 kHz, are all examples of interference that is easily controlled with the flexible PBT system. Allied with the choice of up to five bandwidth filtersand the variable notch filter, the R7 operator is able to confidently challenge any situation, including those with multiple sources of interference.

In designing the R7 receiver R.L. Drake engineers had the foresight to allow for the use of up to five crystal lattice filters, independant of mode. Drake supplied quality Japanese-made filters. Others employed equally fine Sherwood filters that were manufactured in the United States.

One point of contention with the R7 and its predecessors has existed for years. I am referring to its reputation for less than pleasant audio quality. The use of the front panel speaker does justify, this complaint. After properly positioning the desired signal carrier in the passband, I found that the Drake 6 kHz filter allowed for pleasant, wideband audio; this is especially true when use is made of the Drake MS4 speaker. Those looking for a good-sounding external speaker might seriously consider the MS4. Audio quality is of course, a subjective opinion. Steve Bohac, a Drake receiver owner, who is well-acquainted with R7 design and operation, reports that "the Drake R7 begins to roll-off low frequency response at 500 Hz. The Drake's audio is tailored by the manufacturer for 300 Hz highpass audio —optimum for SSB reception, in keeping with the Drake R7's major use as a ham radio receiver. The audio reproduction is not optimum, nor user-adjustable for best audio reproduction in the AM mode."

R.L. Drake used high-quality components in assembling the R7. Despite the use of printed circuit boards, there is point-to-point wiring still evident. Most boards are removable, should service be necessary. Those unable to do such work, will find that the R.L. Drake Company has a well-respected service department. The company may be contacted at 540 Richard Street, Miamisburg, Ohio 45342. Those considering the acquisition of an R7 should be aware that the earliest version(c. 1979) had only fair spurious signal rejection. Some suffered from power supply-generated birdies. Drake offered a correction for the elimination of these unwanted signals.

Those wishing to read more about the Drake R7 receiver should consult articles in the IRCA Technical Manual or the NRC Receiver Reference Manual, volume two. Larry Magne included a thorough discussion of the receiver in the 1982 WRTH. Although I do not have the specific issue date, I am certain that QST Magazine would have featured the R7 in the monthly Product Review column. Finally, Vincent J. Pinto contributed an article describing the construction and use of a synchronous power line noise blanker, in the June, 1983 issue of The Lowdown, a publication of the Longwave Club of America. Mr. Pinto, in the November, 1984 Lowdown, offers his thoughts regarding the use of the R7(A) at longwave frequencies.



R.L. DRAKE COMPANY DRAKE

If one can forego the obvious shortcomings of the R7(A), it will offer solid performance within its coverage of the radio spectrum. The prospective owner must decide whether the R7(A) features meet the desired standards and needs.

THE JAPAN RADIO COMPANY'S NRD•515

A DXERS PERSPECTIVE

KIRK ALLEN AND DAVID CLARK

INTRODUCTION

The Japan Radio NRD-515 was released in late 1979 but was replaced by the current model NRD-525 in 1986. The newer model indeed has more "bells and whistles" and from a marketing viewpoint, is clearly meant to provide a "high-end" alternative to the Icom R71-A and the more recent Kenwood R-5000. Even so, JRC took some cost-cutting shortcuts, such as in the area of stage isolation and overall mechanical ruggedness. Thus, from a serious DXer's standpoint, the 515 continues to have much to offer in terms of fundamental overall performance and probable long term durability. In fact, we find it difficult to believe JRC did not continue producing the 515, albeit with a few desirable improvements such as adding an IF notch.

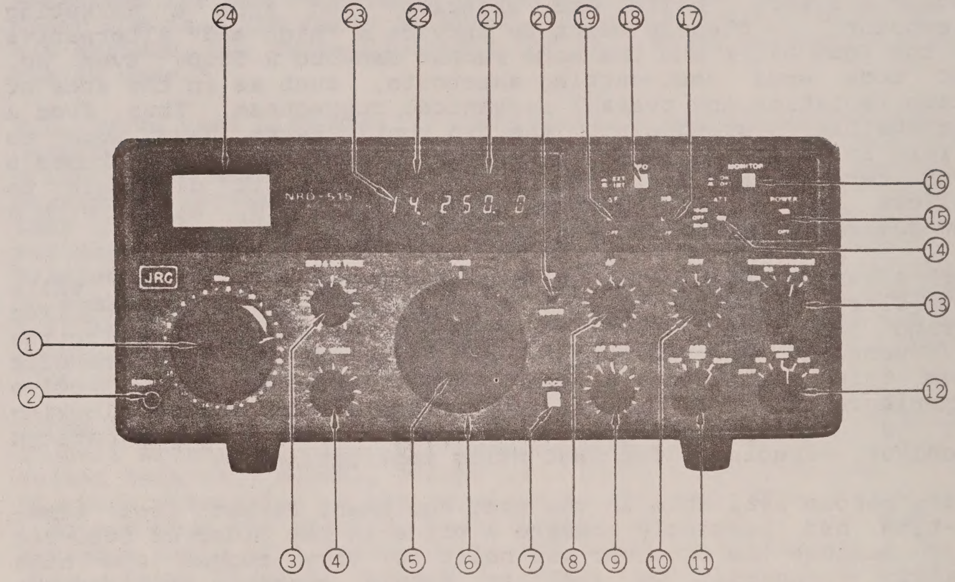
Kirk Allen has been using the 515 for the past 6 years, while Dave Clark has used his almost exclusively since it was acquired during the summer of '87 from Universal Shortwave during the NU/FTvention. We hope readers of 'Proceedings' will benefit from this collaborative user review. Based on our collective experience with this fine rig we commend it to anyone looking for a high-performance, semi-professional communications receiver, especially for SWBC DXing applications.

515's become available in the used equipment market from time-to-time and presently command a price in the order of $600-700 U.S. Because the receiver was built to very rugged and high quality standards, we feel it should continue to offer the purchaser many years of satisfactory performance.

The manufacturer's specifications and related technical data are readily available elsewhere so we won't dwell on those aspects here; references to performance specifications will be made primarily as they relate to our review and assessment. The approach will be to outline the functional aspects of the receiver, by describing the controls (see page 2) on the front panel.

Much of the text reflects our common viewpoint, but we have included our own particular comments [parenthetically identified as (KA) or (DC)] where appropriate. We would remind the reader that no two people will have an identical interpretation of the characteristics of any receiver. Individual techniques do vary so you will find that our opinions vary some too. We believe the result is a balanced perspective for those who are thinking of buying a 515.

FRONT PANEL CONTROLS - (see text for functional details)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JRC
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MONITOR
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POWER

MODEL NRD-515 ALL WAVE RECEIVER

TUNING FEATURES

The beauty of the 515, whether for casual listening or more serious DX, is the simplicity of tuning. Compared to certain other rigs such as the Drake R7 series and the Icom R70, tuning the 515 is a breeze. The only disadvantage of the 515 is that desired frequencies cannot be punched up directly unless you buy the optional Keypad Frequency Controller (Model # NCM-515).

Reception mode is selected using the five-position Mode Control (#12). Positions are provided for RTTY, CW, LSB, USB and AM. Luckily for the SWBC DXer, the tuned frequency is not changed during any combination of switching between AM and either sideband. The "automatic offset" employed in the R71-A is a disaster in that every mode change (typically between upper and lower sideband) forces you to retune the intended signal.

The MHz Control (#1), which utilizes a photo type rotary encoder for long term durability, tunes in twenty-nine 1 MHz steps to cover the 100 kHz to 30 MHz tuning range of the 515. Rapid slewing within any MHz segment may be achieved using the Up/Down Switch (#20). This allows you to tune approximately 100+ kHz per second. It is also possible to cross a MHz boundary using the Up/Down Switch (or the Main Tuning Control) and the correct frequency is still displayed without the need to adjust the MHz Control to the new implied range - a nice convenience.

Selection of the desired frequency within the MHz step is achieved with the kHz Main Tuning Control (#5). This control varies the frequency in 100 Hz steps at a rate of 10 kKz per full rotation. Due to the 100 Hz synthesizer steps, some "bagpiping" is noticable when tuning rapidly past signals in either SSB or CW mode although there is no audible effect in AM mode.

The kHz Main Tuning Control includes 500 Hz analog markers on its outer perimeter and there is also a push-button electrical Dial Lock (#7) to ensure, if desired, that the tuned frequency is not accidently disturbed. Note that the kHz tuning and all switching functions are electrically controlled - no mechanical functions to wear out - a real plus in terms of ensuring long term reliability.

Even more precise tuning is possible using the Delta Tune (^F) Control (#8) which is enabled using a simple On/Off switch (#19). When engaged, a green indicator light (#21) is illuminated. The Delta Tune is JRC's name for a fine-tuning (or RIT) function, which provides continuous (infinite) tuning +/- about 2 kHz relative to the 100 Hz frequency selected by the Main Tuning Control.

Using the Delta Tune is necessary when tuning an AM signal in the Non-Synchronous Heterodyne Detection (NSHD) mode, commonly known as Exalted Carrier Selectable Sideband (ECSS). Tuning any signal which is actually being transmitted in USB or LSB will also require use of the Delta Tune. The tolerable degree of frequency deviation for natural audio in SSB is about 40-50 Hz; therefore, it is often necessary to be able to touch up the frequency, virtually down to the closest Hz, to attain in-phase audio when using the SSB mode. Note that fine tuning using the Delta Tune does not alter the displayed frequency although received frequency is in fact being changed. The digital display shows only 100 Hz changes when the Main Tuning Control is used.

The absence of a continuous tune RIT is an unfortunate omission on the Icom R71-A although it does tune smoothly in minimum 10 Hz synthesizer steps. You have to modify the R71-A to get RIT, whereas it was provided on Icom's predecessor R70 model.

The digital RIT in the newer NRD-525 also tunes in minimum 10 Hz synthesizer steps, so the continuous tune RIT in the 515 is advantageous although it does take a bit of getting used to. A steady hand and very slow adjustment is the order of the day for critical NSHD purposes.

At this point, we have a couple of observations on problems with the frequency display and Delta Tune Control, although these are likely alignment bug-a-boos.

In Kirk's case, the 100 Hz frequency display is not precise. To compensate, the Delta Tune must be switched on and adjusted to zero-beat a known accurate frequency (such as WWV). The station used as a tuning guide must be within several MHz of the desired band or the displayed frequency will not be totally accurate.

"Compared with Kirk's experience, my receiver (bearing a fairly late production serial number) provides on-the-nose frequency readout throughout the tuning range with the Delta Tune switched "off". With the Delta Tune switched "on", one would expect that correspondingly accurate frequency readout would be realized with the RIT control in the center position. With my receiver, however, one must zero-beat a known frequency such that the tune control will always be offset to about the 1:00 o'clock position.

"After the desired signal is tuned in (and frequency to the nearest 100 Hz has been determined), it is then often useful (especially in SSB mode) to tweak the RIT (in combination with the Passband Tuning Control) to achieve the best possible combination of audio delivery and interference rejection. This is inconvenient because care must be taken to re-set the Delta Tune to the "corrected" position to ensure accurate frequency readout when changing from one signal to another. I strongly suspect that in a properly adjusted receiver, correct frequency readout with Delta Tune "off" should correspond with Delta Tune "on" and the Delta Tune control set to center position." (DC)

We have been advised by Steve Bohac (a fellow 515 owner) and John Tow that our problems likely relate to an oscillator (possibly the synthesizer's reference oscillator) being off-frequency due to component aging and that the RIT probably just needs an internal pot or trimmer adjustment. Thus, it seems likely that these anomolies can be corrected.

STABILITY

We are impressed with the frequency stability of the 515, an especially important consideration for NSHD purposes. The conservatively rated specification claims a drift of less than 50 Hz per hour after warm-up. "Let me tell you I have never (!) had to retune a signal once the receiver is warmed up, provided the received signal is stable. I've found a sufficient time for warm-up is 15 to 30 minutes at most. Even then, if retuning is required, it never amounts to much". (KA)

The 515 is head and shoulders above the Drake R7 series which has an annoying tendancy to drift, even after an extended warm-up. This is doubly unfortunate in that the Drake has a rear panel jack which enables it to be used as a frequency counter for an older "boat anchor" analog receiver.

SELECTIVITY

The Bandwidth Switch (#13) provides for 4 selectivity choices, which happily are selectable independent of reception mode to give you maximum flexibility. Two filters are standard equipment. The wide AM ceramic filter, nominally rated at 6 kHz, typically measures between 4.5 and 5 kHz at 6dB bandwidth and at about 10 kHz at 60dB. This is quite a good filter for general listening to reasonably strong signals (unless adjacent channel QRM is too severe) because it delivers very clean audio.

The other standard filter, nominally 2.4 kHz wide, is a mechanical filter of Japanese manufacture. Typical measurements for this filter are about 2.2 kHz at 6dB and about 4.5 kHz at 60dB. Due to the narrow "nose" and steep skirts typical of mechanical filters this filter delivers muddy audio in a narrow AM mode. However, it performs admirably for its intended purpose - SSB and NSHD reception.

The other two selectivity positions allows the user to select an optional .6 kHz CW filter, as well as a fourth "Auxiliary" position for an even narrower .3 kHz CW filter or some other substitute filter. "If you're a ham radio operator and you work CW, the 515 is superb when the optional narrow CW filter is installed. I've put the 515 through rigorous tests and it always performs admirably. I've purposely tuned to the most congested portion of an amateur band in order to hear just how many CW stations I'm able to separate on one tuned frequency. With careful adjustment of the Passband Tuning control to vary the positioning of the signals within the passband, the 515 will successfully separate five and sometimes six different CW stations on or very near a specific frequency!" (KA)

Many purchasers chose a "compromise" ceramic or mechanical filter rated at 3-4 kHz for the Auxiliary position, thus achieving somewhat better selectivity than afforded by the 6 kHz filter along with better audio in AM mode than the 2.4 kHz filter delivers. Such filters were available from the three primary suppliers - Universal, Gilfer and Radio West.

"For serious DXing, I chose to purchase a mounting board from Universal which included the .6 kHz CW filter and more importantly for me, an auxiliary 1.8 kHz mechanical filter for narrow SSB/NSHD purposes. The 1.8 kHz filter is excellent for tight situations, an important consideration on the tropical bands. Recovered audio compares favorably to the 2.4 kHz filter, especially for digging out a voice ID.

Judicious use of the Passband Tuning control (#10) will also improve the intelligibility of a weak signal which is subject to QRM from a nearby carrier. It is often possible when using the narrow filter to adjust the PBT to push the interferring signal right off the side of the upper or lower sideband, whichever is applicable. In large measure, this combination helps to eliminate hets and sideband splatter which can pass through the wider 2.4 kHz filter." (DC)

USING THE PBT CONTROL

The Passband Tuning Control is the little jewel that allows one to substantially and many times completely eliminate adjacent channel interference. This will of course depend on the filter being employed and the relative strength & proximity of an interferring station. It is an essential feature for digging out difficult DX signals and thus is one of the most valuable features of the 515. The effectiveness of the passband tuning function is naturally complemented by the receiver's excellent dynamic range.

In the 515, the PBT operates only in CW and SSB/NSHD modes because simple diode detection is used for AM mode. About 1985, ESKAB made available a phase-locked AM detector on a printed circuit board which could be mounted inside the 515. However, it never really caught on and early models at least were reported to suffer from functional and quality control problems. "I have had the more recent PLAM board from ESKAB installed in my R71-A and I must confess it works very well. Perhaps the earlier version for the 515 deserves further investigation. We would be interested in hearing from any reader who has installed the device in the 515." (DC)

While the Drake R7 series and the newer NRD-525 provide for PBT in AM mode, it could probably be argued that the same effect can be achieved by slightly off-tuning the receiver several hundred hertz to the sideband least subject to interference. This will also enhance high end audio recovery, albeit at the risk of introducing some audio distortion. But for serious DXing when the PBT control is more likely to be required, then one should really be using the SSB/NSHD mode anyway.

The principal purpose of the PBT Control is to position the carrier of the desired signal in the passband to minimize or eliminate interference. It also serves as a tone control. The centre audio position in LSB mode is about 10:30; about 1:30 in USB. Shifting the PBT control slightly away from the respective centre positions will enhance the recovery of the higher audio frequencies and help eliminate muddy lows, especially when a narrow filter is being employed. This is useful when trying to get the best intelligibility from a weak signal for that all-important voice ID. Also, in cases where RF interference is troublesome, tuning in SSB/NSHD mode and use of the PBT control will often give you a much-improved S/N ratio than with conventional AM mode. Well worth remembering!

A Practical Example:

The following is a tuning example which demonstrates both the operation and value of the PBT Control...

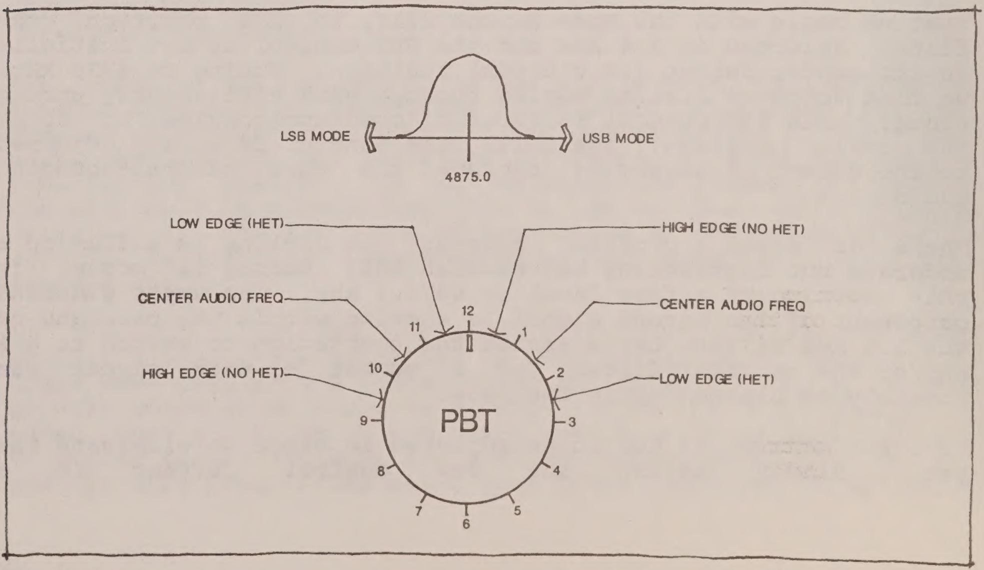
"Let us begin with the Mode Switch (#12) in LSB position, the filter selected is 2.4 kHz and the PBT Control is set initially in the center detent (12 o'clock) position. Tuning to 4875 kHz, we find Voice of Jinling coming through with a reasonably strong signal. The PBT Control is rotated counterclockwise to about the 10:30 position. The Delta Tune Control is slowly adjusted to the extent necessary to achieve the most natural-sounding audio.

There is still a problem, however, as Jinling is suffering a moderate but distracting het because RRI, Sorong is coming in this morning at a fair level on 4874.7 kHz. The upper sideband component of the Sorong signal is showing within the passband of the 2.4 kHz filter. Let's resist the temptation to switch to USB and/or the narrower filter for a moment - this signal can possibly be cleaned up in LSB mode.

"The PBT Control is now to be adjusted in order to eliminate the het. Slowly adjust the PBT control further in a counterclockwise position (say between 9:30 and 10:00 o'clock) such that the maximum possible audio (with more treble) is recovered but the het just disappears out of the passband. The 9:30 position is the approximate upper limit of the passband which permits reasonable audio recovery (not the lower limit as one might expect). This is confirmed by now adjusting the PBT Control to the 11:30 position which is the corresponding lower limit of the passband. Here the het becomes even more pronounced (a greater proportion of Sorong's signal is now making it within the defined passband). Now, what about using USB mode instead?

"If the RRI station drifts up even closer to nominal 4875 or is making it at signal strength relatively equal to Jinling, then it is quite likely the Chinese signal can be coaxed through with a cleaner result by switching to USB mode. Note that the PBT control is now to be positioned clockwise from centre position and the upper edge for audio recovery falls at about the 12:30 position (with no het being experienced). Even in USB mode, if the PBT control is rotated further clockwise towards the lower edge of the passband at about the 2:30 position, some het from Sorong may be noticed. The best position for maximum intelligibility and total absence of a het is likely to fall between 12:30 and 1:00 o'clock (keep in mind that you can use the PBT function as a form of tone control as well).

Perhaps the following diagram will clarify matters. In our tuning example using the 2.4 kHz selectivity position, it was possible to bring up the Voice of Jinling signal (4875 kHz) essentially clear of the adjacent Sorong QRM (4874.7 kHz) by setting the PBT control at the 9:30 position (in LSB mode) or the 12:30 position (in USB mode).



"Of course, if the two signals in our example are both coming through at better than average levels, and being separated only by two or three hundred hertz, it is probable that a tighter filter (in my case, the 1.8 kHz mechanical) will be required to narrow the passband to minimize, or possibly eliminate, those vestages of the interferring het getting in under the wider filter. Now, the tunable range of the PBT control tightens up: between approximately 10:00 and 11:00 in LSB mode and correspondingly, between about 1:00 and 2:00 o'clock in USB mode. This calls for even more careful adjustment to wring out the best possible combination of readable audio with minimum QRM. For purposes of our example, if the 1.8 kHz filter is required, USB mode with the PBT control set at about the 1:15 position would yield the cleanest signal from Jinling.

"Low and behold, however, we now find a powerful ute carrier on about 4876 has suddenly jumped on the air, severely chewing up the Jinling signal in USB. Clearly, we must revert to LSB in this case. However, the strength of the RRI signal inhibits our ability to bring in Jinling without some het QRM, even when the auxiliary narrow filter has been employed and the PBT control carefully adjusted (near the 10:15 position) for maximum interference rejection. Where is that IF notch when we need it most?" (DC)

DEFICIENCIES

(a) Absence of Notch Filter:

The preceding tuning example is a real life situation that has been selected to point out the most significant and glaring deficiency of the 515 for DXing, notably, the absence of a notch filter to clean up the signal in adverse situations to which we're all accustomed. One can do only so much with a narrow filter and adjustment of the PBT Control. We suggest that a reasonably good IF notch (with a notch depth of say 30 dB or more) would be just the ticket to clean up our Jinling signal by zapping that unwanted Sorong het!

Nonetheless, all is not lost. One solution comes in the form of an outboard audio notch filter, inserted between the audio output and your headphones or speaker. The Autek QF-1A (refer to review elsewhere in Proceedings) or one of the highly-acclaimed Datong models are examples of suitable units.

Another possibility is to take advantage of the 455 kHz IF out provided on the rear panel of the 515. A device like the old Hammarlund HC-10 Converter would provide even more selectivity flexibility, together with the all-important notching capability.

(b) Ineffective Noise Blanker:

We, like most owners of the 515, have found the switch-selectable Noise Blanker (control #17) to be a big disappointment. This is the only other operational deficiency of any consequence that we have found with the 515, at least from the perspective of a SWBC DXer. While of modest benefit in reducing the Soviet OTH "woodpecker" QRM, the noise blanker is of negligible use in muting pulse-type electrical hash, static or other forms of RF interference. This could be a concern to those living in a high-noise urban environment. Here again, an external audio filter and perhaps also an equalizer, such as the inexpensive Radio Shack 7-band unit, would be of some help.

OTHER ASPECTS

The Automatic Gain Control (#11) is used for varying the release time constant. In the "off" position, the gain is manually controlled by the RF Gain (Control #4). This is a useful feature at times for tuning very weak signals. Some receivers don't even provide for disengaging the AGC.

Manual control of the RF gain can also serve in lieu of the three-position (10 dB, 20 dB and "Off") Attenuator (control #14) in the presence of very strong signals. However, the signal-handling capabilities of the 515 are so good that desensitizing it by whatever means is seldom, if ever, required. The manual claims that cutting the RF gain manually can reduce the effects of adjacent channel QRM. We find no evidence that this is so; it merely depreciates the overall sensitivity of the receiver without cutting the level of QRM. There are better ways to tackle the matter of interference rejection which we have already dealt with at great length!

There is a slight but noticable loss of audio gain when the AGC is invoked. Also, audio variations are detectable in the AGC line when the receiver is operated in the AM mode. The FAST position is normally used for tuning in AM and NSHD modes, while the SLOW position is used primarily for "true" SSB tuning. "I don't recommend the slow setting for NSHD tuning because one will often lose much of the audio due to fading." (KA) "My experience is somewhat at variance with Kirk's: I like the slow position as it seems to do a good job of smoothing out the audio which at times is more choppy in fast mode, especially in the presence of QRM. To some extent we're probably talking personal listening preferences here." (DC)

The S-meter (#24) only operates when the AGC is on. However, it is non-linear & inaccurate and totally unresponsive to weak but quite readable signals. To the extent that anyone chose to use the S-meter readings to evaluate the relative strength of signals he would be very much in error. In that sense, the poor S-meter circuitry must be considered a third deficiency, although not critical to the operation of the receiver.

The BFO/BC Tune (control #3) is used for two different functions. On the BCB, it functions as a preselector for peaking the signal and usually requires adjustment, even when frequency is changed by only 10 or 20 kHz. It only peaks signals between 600 kHz and 1599.9 kHz; however, it actually introduces a signal loss of 15 to 18 dB. This is a detriment to weak-signal, foreign reception but can be overcome with the use of a hi-Q loop. Signal strength below 600 kHz at the lower limits of the BCB is actually greater without the BC control engaged.

Outside the BCB range, the BFO function is used solely for adjusting the beat tone when tuning in the CW mode. However, one can achieve the same result by varying the Delta Tune and the location of the latter is much handier than having to reach to the far left of the front panel.

Overall BCB performance is pedestrian, especially for DXing the split-frequency Latins and TA's/TP's. Rejection is sub-par in the face of strong locals nearly every 10 kHz these days. Steve Bohac advises that this is caused by some signal leakage and coupling around the IF filters which degrades the receiver's interference rejection in the deep-skirt region. The manual indicates that the arrester diodes in the antenna input circuit can also be a source of inter-modulation distortion. Instructions are provided for their removal if the user so-desires.

Neither of us have experimented with the use of air-core or ferrite loops which are more appropriate than random wire antennas. "I have heard medium-wave stations from Japan, France and Monaco with the 515 connected to a Beverage antenna. Even so, the amount of adjacent channel interference was very high. I find its BCB performance to be rather disappointing." (KA) "I have yet to find a modern receiver (including Drake, Icom and JRC) that came anywhere close to providing the level of DX performance on the BCB that many of the better grade tube-type receivers are capable of. Enough said!" (DC)

The manual emphasizes the importance of connecting an Earth ground before turning the receiver on. This is important. We find that the receiver will "bite" if the ground isn't connected while the rig is on. Better to play it safe.

Remember also, the 515 does not contain an internal speaker - the optional NVA-515 or an equivalent 4 ohm communications speaker is required. Most DX'ers will probably employ headphones most of the time and the manual indicates that low impedance phones (4 to 8 ohms) are appropriate. Nevertheless, JRC makes a very high quality communications headphone set

(Model ST-3) having an impedance of 600 ohms "which I've found to work extremely well for DXing purposes. The padded earpieces and headband make for tireless extended use and I can certainly concur with the advertising copy which says that the excellent voice response makes for exceptional clarity." (DC)

Finally, there is the optional 96 channel memory unit (Model NDH-518). This supplanted a 24 channel unit made available when the receiver was first released. The memory unit (and the aforementioned frequency keypad) essentially "upgrade" the 515 to the level of technological convenience of more recent receivers.

"The memory unit is a great aid for quick scanning of stations on a given band, stations from a favored DX target area or for checking parallels. The memories are arranged in 4 banks of 24 channels. I use one bank to store all of the Tropical Band PNG's, while two other banks are primarily dedicated to Tropical Band Indonesians.

"When the memory mode is in use, all the essential receiver controls such as RIT and PBT (except for the MHz and Main Tuning controls) remain operative. Thus if necessary, it is possible to touch up the tuning of a station in a memory channel. The disadvantage, however, is that when one leaves that memory channel and subsequently returns, the signal remains tuned as it was when first-memorized. Therefore the memories are not truly tunable (as in the case of the R71-A); You must re-memorize whenever you want to "permanently" touch up a channel. This is a nuisance, especially during a hot DX opening when you want to instantly check parallels on the fly without having to re-adjust for critical tuning differences. It is troublesome to take the time to re-tune and re-enter individual stations into memory from scratch. Still, the memory unit is a very useful aid to the serious DXer." (DC)

ANOTHER PRACTICAL EXAMPLE

Let's fire up the rig at Kirk's QTH and see how it's done. Nothing hypothetical here, either. This is real life with the 515!

"A typical DX session here goes something like this. Having selected the intended frequency range with the MHz control, I turn the mode switch to LSB, situate the PBT control at about the 10:30 position and begin to slowly scan the desired frequency range, listening for intended targets and/or unusual heterodynes. Remember, I'm tuning in the NSHD (i.e., pseudo-SSB) mode so it's much easier to detect an unusual carrier than when scanning in the AM mode, which is something I never do.

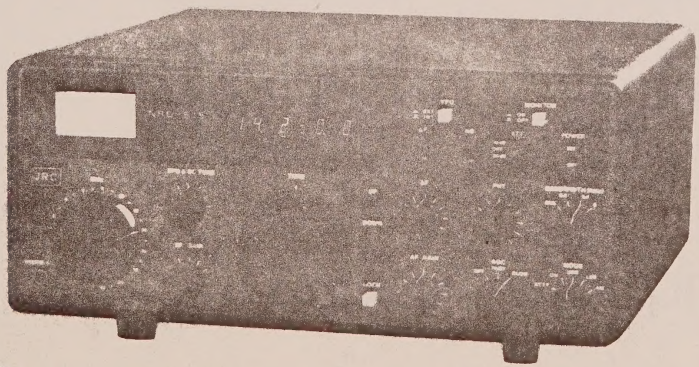
"I've finally come across an interesting signal on 5014.9 kHz, just below the powerful USSR station on 5015 kHz. Next, I zero beat the station on 5014.9 by slowly adjusting the Delta Tune control, thereby achieving natural-sounding audio. Now I'm ready to try eliminating the unwanted adjacent channel interference. I've selected my narrow 2.4 kHz (or optional) filter and adjust the PBT control (between about 9:30 and 11:30 positions) until the interference is at a minimum (near the 11:00 o'clock position in this case).

"With the big signal on 5015, the copy on 5014.9 is still pretty difficult but with the rejection capabilities of the 515, I'm finally able to identify the target station. I'm rewarded with the ID for 'Escuelas Radio Populares' which hadn't been on the air for years! Once again, the 515 has "done me proud", considering that it was able to separate a station that is a mere 100 Hz away from the much stronger interfering station! Sounds simple? Yes, relatively so. The simple tuning technique of the 515 is a joy." (KA)

IN CONCLUSION

"The 515 is discontinued but still alive and well! I can honestly say that I've never regretted having bought this radio. Using the 515 has been an almost religious experience at times. Little did I realize when I unboxed the receiver back in 1982 that it would be the beginning of a beautiful and hopefully very long relationship. I STILL can't believe that JRC discontinued production!!" (KA)

"Eloquent words from Kirk, whose sentiments I share, even though I have only owned the 515 for a year. But during that time my souped-up R71-A has practically sat on the shelf. That's strong testimony to the operating pleasure and superb results I have enjoyed! I am fortunate to own a number of classic boat anchors which I wouldn't part with. But the 515 ranks second in my book after the 1950's dandy Hammarlund SP-600 when it comes to a 'quiet' receiver, synthesizer and all! In my view, the 515 is THE vintage SWBC-DX receiver of the modern era." (DC)



peripheral equipment

ANTENNA TUNERS

AN OVERVIEW

JOHN R. TOW

Antenna tuners always seem to fall into a grey area for SWLs. Hams would tell you that they are not a necessity unless you are transmitting. Others would tell you that they only satisfy the knob-twister's desire to constantly 'tweak' something. I maintain, along with many others, that they are a necessary evil.

Antenna tuners are available in two basic forms: antenna impedance transformation devices and passive preselectors. Either type would give you additional adjustments, if that is all you want. The former type might give you an additional S unit or so to aid in IDing that Indonesian in the 60 mb. The latter might keep the night-time 49 mb slop from IMing your listening to Tahiti on 15,170. Let us dig a bit deeper, first with the latter type, the passive preselector.

The passive preselector is basically a solid state era goodie. Back in the 'hollow state' era, a preselector included a vacuum tube active stage. This was later followed by jFETs and finally MOS-FETs as gain stages. Receivers were not as sensitive then, especially on the higher frequency bands. (Signals were not as strong then either - 50 - 100 kW was about it for even the 'big gun' broadcasters.) The mid - 70's brought the first of the Wadley loop and up-conversion solid state receivers. Sensitivity improved, but front end selectivity went to pot. In fact, most modern-era solid state receivers employ bandpass type circuitry as opposed to tracking tuned circuits in their front end circuitry. Let me briefly explain the difference.

The tuned RF (Radio Frequency) amplifiers of the earliest solid state receivers, like the SX-190 & DX-150/160/200 series, used gang tuning to make their front end tuned circuit 'track' or follow their mixer and local oscillator main tuning control. This was the very same system employed by the vacuum tube receivers as well. Many receiver designs made the RF amplifier tuned circuits externally adjusted by a preselector knob. Both types of tuned RF amplifier maintained a fairly high Q (quality factor - The ratio of a tuned circuits center frequency divided by its bandwidth at a given attenuation.). Even with a very low Q for this type of circuit, one of perhaps twenty, would render a +20db/S9 5 MHz signal down at its 3rd harmonic of 15 MHz to S4 or so. At that level, it would not overdrive the RF amplifier tuned to the desired 15 MHz frequency.

Modern receivers with synthesized front end circuitry use the now common bandpass tuned circuitry and wideband amplifier in place of the tuned RF amplifier previously described. Such tuned circuits generally exhibit much lower Q's with far inferior out-of-band rejection. A typical receiver, like the Kenwood R-1000/2000, Icom R-70/71A, or Yaesu FRG-7700/8800, would use a 3 -5 pole bandpass filter generally covering an octave of response (0.5-1.0, 1-2, 2-4, 4-8, 8-16, & 16-30 MHz). In the previous example of a +20db/S9 signal at 5 MHz, the attenuation this signal would see in a receiver tuned to 15 MHz would likely reduce it to the S9 level, still a substantial signal capable of overdriving the following wideband amplifier and producing both crossmodulation and intermodulation distortion. A preselector, either a passive or a properly designed active type, would improve the ability of such a front end to reduce the level of such an interfering signal.

Passive preselectors are characterized by the frequency specific bandswitch and tuning control. Examples of such devices are the Yaesu FRT-7700, Grove TUN-3, and an MFJ unit. Please note - MFJ makes a wide range of antenna tuners as well as both an active and a passive antenna tuner. Check with any of the usual distributors, or even a recent ham magazine such as QST, 73, or Ham Radio, for their ads.

A few words on the subject of active preselectors are in order. Generally speaking, most modern receivers do not need the gain of an active preselector. In fact, at lower frequencies the very device in the active preselector itself, if not optimized for strong signal handling capabilities, may cause crossmodulation distortion. Such devices as VMOS FETs and FETs and BJTs designed for CATV use, though optimum for such a preselector, seldom find their way into a commercial product. All of the active preselectors I have seen employ standard jFETs or MOSFETs, devices designed for receiver front end use with low noise, high gain, and remotely controlled gain (AGC) capability coming first. The lower noise figure of the better preselectors could be of some benefit with either a low noise antenna, such as a Beverage, or at the higher frequencies now that the sunspots are returning. Thankfully, the gain of most preselectors decreases with increasing frequency, so overloading subsequent stages is less likely where the preselector is needed the most. In addition, the selectivity of the typical active preselector is much greater than that of even the best of the passive types. This enhanced selectivity will require more frequent and more critical adjustment from one end of a band to another.

None of the aforementioned accessories will do much for 'matching' your antenna to your receiver. You might think that impedance matching is unnecessary - think again! Your stereo would not like a 0.5 Ohm speaker load. That type of mismatch would offer very poor efficiency in conveying the output power of your stereo to your speaker. Your communications receiver's front end (antenna input) is no different. Match your antenna impedance to your receiver's input impedance by one of two methods: either use a resonant antenna or an antenna matcher. I'll try to focus on the latter - search elsewhere for resonant antenna articles!

Antenna matchers are available in three basic forms: impedance matching transformers, low pass filter, and high pass filter design. The impedance transformer is often neglected. The low pass filter design is by far the most common design. It is also the simplest design to construct. It can be implemented as either an L or pi section type design. The L section has a variable capacitor connected from the aerial input to ground with an adjustable (usually by a step type switch) inductor connected between the aerial connection and the receiver coaxial connector with the shield grounded. The pi-section tuner adds another variable capacitor from the receiver coaxial connection to ground.

The pi-section tuner is simple to construct, easy to adjust, but not always the best matcher. Its design helps to reduce the harmonic output of a transmitter due to its inherent low-pass filter design. Unfortunately, if peaked for 19 mb, it will allow a great deal of 49 mb energy through relatively unscathed. To optimize such a tuner for the lower frequencies requires a larger range of input variable capacitance than do the upper SW frequencies. For LW down to 160 kHz for example, one would need a three or four gang tuning capacitor with all of the sections in parallel and large values of inductance, such as available from small RF chokes, to resonate. Additionally, a wideband step-up transformer is necessary for those receivers with 500-1,000 Ohm antenna input impedances in the LW-MW spectrum (Drake SPR-4, Kenwood R-1000,2000, Yaesu FRG-7700, etc.). Check with Ralph Burhans via the Long Wave Club of America for reprints of his excellent articles on LW receiving accessories if you need further help with LW reception.

The other type of matcher, the high pass design, is a bit harder to build. The simplest form places the now grounded inductor as the vertical element of a 'T' with the capacitors as the horizontal elements. This can be a real problem in construction since both 'sides' of both variable capacitors are isolated from ground - a real problem since most variable capacitors have their cases connected to the rotor plates (one side of the capacitor). The problem can be circumvented by mounting everything in a plexiglass (perspex to the British ...) case. This is not normally done in ham designs because of high RF levels, RF burns, and harmonic feed-through (Come to think of it, Okechobe isn't all that far ... I wonder if I could get an RF burn from 'WYFR' ???). For the SWL/DXer, the plexiglass case would be fine.

The high pass design will help to attenuate the lower frequencies and thus reduce the amount of lower frequency interference products. This is a great improvement over the low pass design when the listener is bothered by a local BCB station. It does have some operational problems. One is simple - it is hard to get the proper amount of capacitance to resonate at the lowest part of the SW spectrum, much less into the MW and LW spectrum. I would advise a low pass pi-section for the LW + MW range with the high pass for the SW part of the spectrum. The other problem is simple - it places the center connection (long wire terminal) above ground for DC. That is, there is not a return path to ground (or from ground) to discharge the static charge built-up on the antenna. The resulting static charge can cause rain/snow static and even cause failures in your receiver's front end. This is not a serious omission as far as lightning safety is concerned, since all antennas should be disconnected and grounded under threatening conditions. A simple DC path can be added by placing a 2.5 - 10 mH RF choke from the aerial connector to ground, with little loss in signal resulting.

A tertiary type of matcher is a simple wideband transformer. I have used a quadrifilar wound (four windings wound as one) wide band toroidal transformer for quite some time. I series connect all of the windings with one end grounded. I use 15 turns of #28 enameled wire on an Amidon FT-50-43 ferrite toroidal core (Amidon Associates, 12033 Otsego Street, N. Hollywood, CA 91607). The aerial and receiver connections are then clipped to the different 'taps' until the best signal strength is noted. This is most effective in the lower reaches of the SW spectrum down to the LW spectrum. The other matchers are generally more useful, although this one has merit in impedance transformation following a LW L or pi section tuner when matching to one of the aforementioned higher input impedance receivers.

Okay, now that I have a matcher, where do I put it? Simple. Put it as close to your antenna as possible. Everything connected to its input is considered as part of the 'source' impedance to be matched to your receiver as a load. I leave mine on the window sill where my long wire aerial enters the house, about 20' from the actual end of the antenna itself. The output is fed via RG-58 50 Ohm coax to my receiver some 15 feet away. The tuner's function, recall, is to match one impedance to another. If I were to have the tuner at the receiver site, it would be a good bit easier to adjust. Unfortunately, the feedline to the tuner is then 'part' of the antenna. Besides picking up more electrical noise from your house wiring, the feedline will couple additional capacitance to ground to the input of the tuner, thus making high frequency high antenna impedance (low capacitance) matching impossible with the pi-network tuner. Placing the antenna tuner in a window is not such a bad idea - most adjustments are fairly broad and can be made with the receiver 10-20 feet away.

What about using the matcher with a coaxial cable fed antenna? If the antenna is of the resonant type, i.e. a 1/2 wave dipole fed by a 70 Ohm cable, the matcher will do little if any good. There is little to be gained by attempting to match a 70 Ohm line to a 50 Ohm line. Just run the 70 Ohm line all the way! CBers have used small matchers to lower the SWR at the transmitter for years. They definitely will lower the VSWR (Voltage Standing Wave Ratio - a measure of load matching in transmission line jargon with 1:1 being ideal.) between them and the transmitter - but they still do not affect a mismatch between the aerial and the remainder of the feedline. Most hams know better than to use a matcher in between their coaxial feedline and the transmitter - the complex impedances can result in an RF hot coax shield under certain conditions. Take the lesson from the ham community - do not use your antenna tuner in series with a coax fed antenna and your receiver.

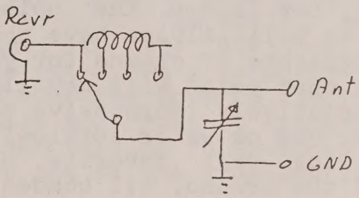
What if you feed a long wire aerial with coax to 'shield' it from noise pick-up? Simple. The coax feedline adds a great deal of capacitance to ground, rendering the tuner's ability to match a high impedance antenna as nil at the upper parts of the HF spectrum. 20' or so of coaxial cable will have about the same capacitance to ground as the usual input tuning capacitor of a pi-network tuner will have at maximum capacitance, allowing no room for adjusting the capacitance under such conditions. You could leave the coax's shield ungrounded, that would lessen the capacitance by a bit, but lessen the noise source shielding ability of the cable as well. Always have the matcher grounded, however. In fact, a separate RF ground for your tuner with the radio grounded only at that point will usually improve reception. Experiment - it is relatively inexpensive to drive a ground rod (Unless you find your gas or water service!) and run out a few 1/4 wave radials cut for your favorite bands and 'pushed' under the surface of the ground, all bonded together at the rod and carried into the shack via a short but large diameter ground wire. I personally use old coaxial cable shield (RG-58,59 or bigger) for ground wire since its usefulness as feedline is shortened by UV exposure, moisture, etc. As long as the shield isn't ripped up, it should still be quite serviceable for ground wire use!

Where can you buy a matcher? MFJ makes a multitude of examples. Many other amateur equipment vendors sell other makes as well. Try a hamfest - there should be a selection to choose from there. If all else fails, build one! Borrow a recent A.R.R.L. Handbook - there are several construction articles for antenna matchers in each edition. The current availability of receiver type variable capacitors dictates a premium price for them - shop at 'hamfests' if at all possible. It could be your first 'project', and a most worthwhile one at that!

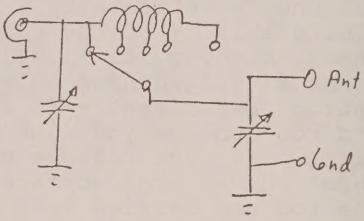
What, then are my recommendations? Simple. If your receiver is easily overloaded or shows evidence of severe crossmodulation, you need the passive preselector type of tuner. Unless you have a dipole for each band, or, perhaps, use an Eavesdropper, you could also use a matching type of tuner. You could certainly use both in some instances. Feed the antenna to the matcher first with the passive preselector second and the receiver third. Some means of bypassing the passive preselector would be nice. Active preselectors do offer some benefits, although they generally can cause overloading problems in modern receivers on the lower frequency bands, especially when fed from large aperture antennas. They can still be beneficial under certain conditions. Cautious experimentation is the key here. Generally speaking, I have had less than favorable results in using active preselectors and tuneable active antennas with outside antennas and thus do not recommend their use. The last comment is based on my experience over the years with several homebrew designs as well as a few borrowed (or bartered) commercial examples in conjunction with my R390A and Icom R-70 and 65' - 160' outside inverted L's (long wire antennas). In fairness, all of my examples have employed low level type active devices. I must try a more crunchproof device, such as the CATV type transistors, V-MOS and FETs, etc. I still have some equipment to build and test! Good listening!

Common Antenna Tuner Designs

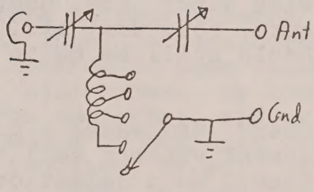
L Section



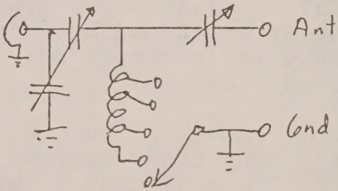
Pi Section



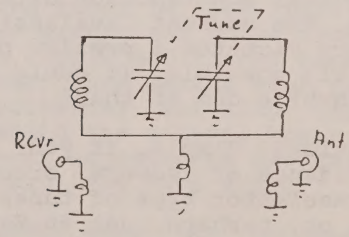
Hi Pass



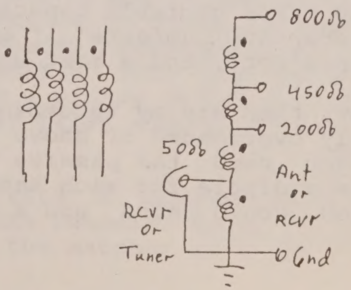
Modified High Pass



Passive Preselector



Quadrifilar Wound Wideband Transformer



CONSTRUCTING AN ANTENNA TUNER WITH PLUG•IN TOROIDAL CORES

CHUCK BOLLAND

An excellent antenna tuner for shortwave receivers is the "T" type antenna tuner. It is called a "T" antenna tuner because of the shape of the circuit. The tuner consists of two variable capacitors isolated from ground and a coil connected to ground. Without special isolating sleeves or devices, the construction of this tuner usually includes placing the tuner in a non-conductive enclosure such as a plastic hobby box. If one wants to keep as much local electrical interference out of the system as possible, a shielded enclosure is more advantageous; however, how can the capacitors be isolated from ground without the special sleeve or devices mentioned before? Radio Shack sells vinyl Gromments(see parts list) which can be used for isolating the capacitors from ground in the "T" antenna tuner.

Why go to all the trouble of building a "T" antenna tuner when there are a number of models on the market that will serve the purpose? Besides having the satisfaction of building the tuner, the tuners on the market, in my opinion, do not give the results that are wanted in many instances and are usually over priced. Drastic words? I have two commercial "T" type antenna tuners setting on the shelf gathering dust because of the disappointing results that they give.

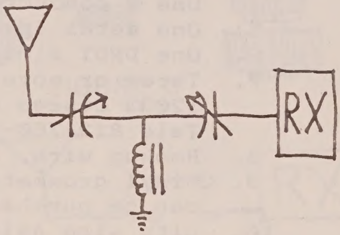


FIGURE 1

After a lot of experimenting with different types of variable capacitors and coils, I have come to the conclusion that an antenna tuner can be improved upon by selecting inductors of different properties for particular purposes. For example, an air wound coil of heavy gauge wire would probably be the best choice for high power transmissions when matching the feed line to the antenna. For high Q, shelf shielding characteristics, a toroidal core coil suggests the best choice.

A convenient "T" antenna tuner would be one with two variable capacitors and a toroidal core coil wrapped with 18 gauge wire which is taped at various points to reduce or increase inductance allowing for changing frequencies. But if a tuner of better selectivity is desired, wouldn't it be better to have a coil designed just for a particular frequency spectrum such as the sixty meter band, rather than having a coil with a large amount of inductance - eventhough it is taped at different points - possibly allowing intermodulation and spurs effect it? When designing communications receivers, engineers do not resort to taped coils in their circuits. For each location of the circuit where inductance is required, a coil of a particular inductance is placed. For a better antenna tuner, using-plug in toroidal cores is sure to give better signal gain to the receiver because there will not be all that potential extra inductance present to cause problems.

To begin with gather the materials and components listed below:

1. Two SO-239 chassis mount sockets. UHF type.
2. Two variable capacitors 10 to 365 pF. These can be purchased from the following venders for approximately $10.95 each:

    G. C. Electronics, 400 South Wyman St., Rockford, Illinois 61101. Tele 815-968-9661. Stock No. A1-227

    Circuit Specialists, PO Box 3047, Scottsdale, Arizona 85257. Tele 800-528-1417 Stock No. A1-227

    Mouser Electronics,2401 Highway 287 North, Mansfield, Texas 76063 Tele 800-346-6873 Stock No. 524-A1-227

3. Three or more 2 conductor monaural 1\4" Phone Plugs.
4. One 2 conductor 1\4" circuit jack - open.
5. One metal (preferably aluminum) hobby box at least 3" by 5".
6. One DPDT mini-switch center-off.
7. Three or more toroidal cores T-106-2 from Amidon Associates, 12033 Otsego Street, North Hollywood, California, 91607 Tele 813-760-4429
8. Hookup wire, 20 gauge or smaller that is insulated.
9. Vinyl grommets big enough to fit the capacitor shafts. These can be purchased at Radio Shack Stock No. 64-3025
10. Litz wire Amidon Associates above.

The layout of the components on the hobby box is not critical. Usually, the capacitors are place on the right and left front of the box with the two conductor 1\4" jack located between. The two SO-239 sockets will serve as antenna and receiver inputs and should be situated on the back of the hobby box. An additional hole in the extreme upper right hand corner of the hobby box in front will hold the mini-switch.

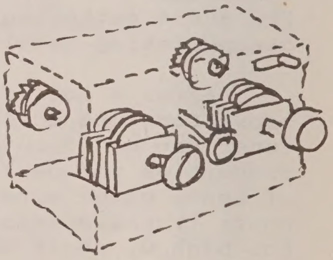


FIGURE 2

STEP ONE: Drilling holes in box.

Drilling holes in the box is usually a chore if one does not have the correct drill bits. I unfortunately do not have many drill bits so I usually drill a small hole in the box and use a reaming tool to enlarge it to the size I need. Perfectionists may feel that this is not the correct way of doing things but it gets the job done especially when ones tool box has been raided so often by a young experimenters. By using a reaming tool, it is a simple procedure to check the size of the hole as you go along thereby getting a snug fit. The circuit jack and switch should fit snugly into the box. The capacitor's shaft hole should be just a little larger than required by the shaft size to allow for the insertion of the vinyl grommets which are required for insolation of the capacitors.

STEP TWO: Connecting sockets.

Next connect the two SO-239 sockets on the back of the cabinet. Using the reaming tool to enlarge the holes you have drilled, check for the correct size as you proceed. The sockets will be the connections for the receiver and the antenna.

STEP THREE: Connect hookup wire.

With everything installed on the hobby box it is now time to connect it all together. From both the SO-239 sockets run a piece of hookup wire to the center connections of your switch. When you are finished, you will have one piece of hookup wire from your antenna socket to one of the center connectors of the mini-switch and the second hookup wire from the receiver socket to the other connector of the mini-switch.

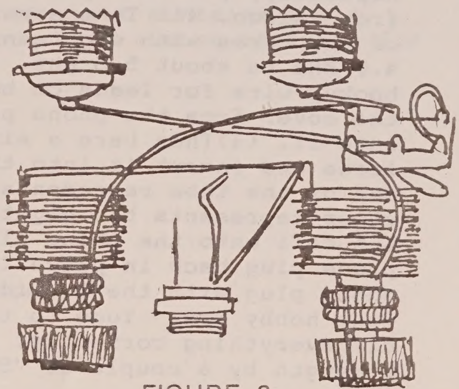


FIGURE 3

As you can see, the switch has six connections. There are two on the right hand side, two on the left hand side and two in the center. We have already taken care of the center connections, now it is time to connect the others. First take a short piece of hookup wire and connect the two right switch connectors together. This is the bypass side of the circuit. When you want to bypass your tuner, you will switch to this side of the switch, effectively bypassing the entire circuit.

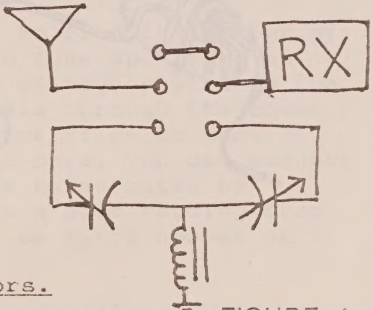


FIGURE 4

STEP FOUR: Connect Capacitors.

Next we want to connect the capacitors up to the switch. To do this we will take two more pieces of hookup wire which should be long enough to reach from the capacitors to the switch. Don`t cut the wires too long! The circuit will be effected if there is too much wire. connect a piece of hookup wire to each one of the capacitors making certain that the wires are connected to the same side of each of the capacitors. The opposite can be done, just be certain that each piece of hookup wire is connected equally. Connect the other ends of the hookup wire to the remaining connection on the switch.

We must now connect the two capacitors to each other. With another piece of hookup wire, connect the capacitors together on the opposite sides that you connected to the switch.

Take another short piece of hookup wire and solder it to the wire we just used to connect the capacitors together. Take the remaining end of the wire and hookup the headphone jack with it. Connect the hookup wire to the socket on the side that is insulated from ground. Set the tuner to one side for awhile.

STEP FIVE: Constructing the coils.

Next we will discuss the construction of the coils. This is the easiest and most fun part of the entire construction project. Hopefully, you have purchased a number of T-106-2 toroidal cores from Amidon. (1) Take some of the 20 gauge hookup wire and wrap one of the cores with eighteen turns of wire. This core will work from 4.0 MHz to about 5.5 Mhz. (2) Leave about an inch and a half of hookup wire for leads on both ends of the wrapped core. (3) Remove the cover from the phone plug and insert the leads from the coil into it. (4)Then bare a sixteenth of an inch of hookup wire of the leads and insert it into the tiny connection tabs of the phone plug. One of the tabs represents the positive side of the plug and the other represents the negative side. (5) Then solder the leads from the coil onto the phone plug and screw the plastic cover of the phone plug back in place.(6) Try out your tuner by inserting the phone plug with the toroidal core coil into the jack on the front of your hobby box. Tune to the 60 meter band and try it out. If you did everything correctly, you should have an increase in your signal strength by a couple of "S" units.

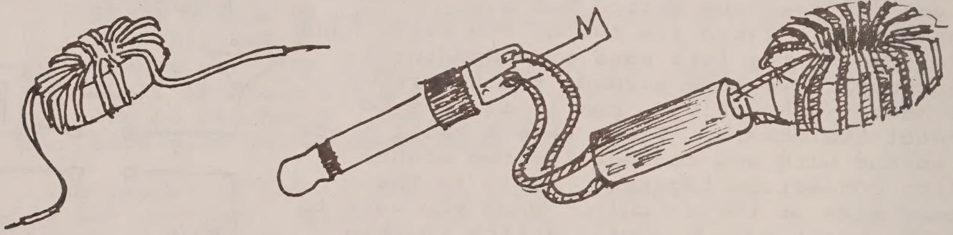


FIGURE 5

Does it work? Maybe eighteen turns of wire on the core wasn't enough or maybe it was too much. Try other bands nearby either higher of lower. If you find that the tuner works on a lower frequency, then you have wound too many turns on the core. Each receiving systems effects the core differently. Don't give up! Try to find the correct winding ratio for your system and the 60 meter band.

Iron Powder toroidal cores come in numerous sizes and are found in two basic material groups: The Carbonyl Irons and the Hydrogen Reduced Irons.

The Carbonyl Irons are noted for their stability over a wide range of temperatures and flux levels with excellent Q factors for the 50khz to 200 MHz frequency range.

The Hydrogen Reduced Irons have somewhat lower Q values and are mainly used for EMI filters and low frequency chokes.

Toroidal cores, in general, are the most efficient of any core configuration because they are highly self-shielding. This is because the lines of flux are contained within the toroidal form. It is seldom necessary to shield or isolate a toroidal inductor to prevent feedback or cross-talk. That is why the plug in toroidal core on the tuner can be located outside of the metal hobby box and not be effected.

When ordering toroidal cores from Amidon Associates, a data sheet is accompanied with the order. This sheet contains the A values which are used to calculate the required number of turns for a given inductance value.

TURNS FORMULA

$$\text{Turns} = 100\sqrt{\frac{\text{desired L (uh)}}{\text{A (uh/100t)}}}$$

To find inductance use the following formula:

$$\text{Inductance L} = \frac{1}{(2\pi f)^2 C}$$

This that clear? There is an easier way to find the number of turns required for the frequencies you want to tune up. Take an extra phone plug and connect two short pieces of hookup wire to the connection tabs of the phone plug. Insert these through the cover of the phone plug and then connect two alligator clips to each of the wires. Now when you have wound a toroidal core, you can connect the leads to the alligator clips and check the turns ratio by reducing the turns one at a time until you get a good reading from your receiver. You did give the toroidal core an extra number of turns didn't you?

I hope you will find this tuner to be beneficial to your antenna system. The two points to remember about this project is the unique coils made with phone plugs and the method of isolating the capacitors from the metal hobby box with grommets. I would like to get so comments either pro or con on this tuner. If this tuner leads anyone to a better method, I would like to hear from you. Good listening!

CHUCK BOLLAND
KA4PRF
P.O. BOX 18402
WEST PALM BEACH, FL 33406

TWO TUNEABLE PRE•AMPLIFIERS BY AMECO

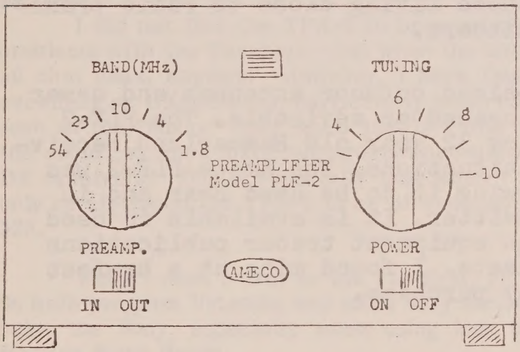
THE PLF•2 AND THE TPA•1

JERRY STRAWMAN WITH JOHN H. BRYANT

THE PLF•2

The Ameco Equipment Company, a division of Ameco Publishing, Williston Park, New York, has been in existence for many years. At one time, the firm produced and sold amateur transmitters and receivers. Today, the company offers a varied line of products, including code instruction materials, test and theory manuals, code cassettes, preamplifiers, test equipment, and transmitting high pass filters.

The Ameco PLF-2 preamplifier is one of the company's products that has been widely sold and accepted. The unit is housed in a metal cabinet measuring 6 5/8"wide, 4 3/8"deep, and 3 1/2" high. The top half of the case is covered by a textured vinyl that resists scratches. Internal components are mounted on a glass epoxy circuit board. The preamp has its own internal power supply that will accept a 117 volt input. The PLF-2 circuitry has a tuned input, designed to resonate from 1.8 to 54 MHz. In practice, my unit will provide a small amount of signal amplification as low as 1.3 MHz. The tuned input consists of an all-metal air variable capacitor and four inductors. One coil, for the lowest range, has an air core, while the remaining inductors are wound in a single layer on ferrite material. The heart of the amplifier is an RCA 40673 dual-gate MOSFET transistor. Assembly and component quality appears high.

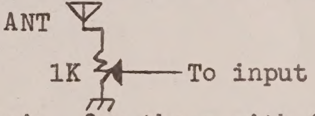


Ameco PLF-2
Front panel controls

Front panel controls include separate slide switches for on/off, and for bypassing the unit. A band switch divides the range of coverage into four sections. The variable capacitor peaks the input within the selected range. Sharpness of tuning varies according to the tuned frequency. At 17.5 MHz, the receiver may be retuned up to 250 KHz before repeaking the preamp capacitor will yield a worthwhile improvement. This decreases to about 175 KHz at 9.5 MHz, 125 KHz at 5 MHz, and 50 KHz at 1.8 MHz. I have used this unit with the Icom R70, Drake R7, and Hammarlund HQ-150 receivers. I was not able to overload any of these fine receivers at any frequency. The correct band range must be employed. The use of an incorrect band range will introduce spurious signals. There is no gain control. In practice at my QTH, the PLF-2 provides a gain of 3-4 S units. The highest gain is at lowest frequencies, although the difference in gain between 5 MHz and 21 MHz is not great. I use a dipole cut for 5 MHz and fed with 450 ohm open wire and a dipole cut for 7.3MHz, fed with 52 ohm coax. Both antennas are in an inverted V configuration with the apex of both at 40 feet. The PLF-2 provides similar gain with both antennas, but does resonate at slightly different dial markings. Signal strength from the preamp output is most dependant on the amount of wire used. Similar results are obtained using half of the 5 MHz antenna as a random wire antenna.

Amplifiers in completing their assigned task do not discriminate between the desired signal and noise, coming from atmospheric and man-made sources. In this regard, the PLF-2 is no different. When properly tuned, the PLF-2 circuitry does not appear to add any noticeable amount of noise to the received signal. Like John Bryant has found with his Ameco preamp, the current model TPA-1, I use the unit to fill out the audio on weak signals.

My main complaint with the design of this accessory, lies in the use of RCA jacks for input and output. RCA jacks will not withstand years of continued use. I have replaced these jacks with my own personal preference, BNC jacks. A gain control would be nice. This omission was addressed by adding such a control on the Ameco TPA-1. Mark Connelly has suggested that a 1K ohm pot might be used ahead of the preamp input in the following manner:



This arrangement might appeal to those living close to radio transmitters.

Extra gain, for those with full-sized outdoor antennas and newer sensitive receivers, may not be needed or advisable. The PLF-2 does provide worthwhile gain to my 32 year old Hammarlund receiver, particularly in weak-signal situations. The Ameco PLF-2 was also available in a version allowing it to be used near and in connection with an amateur transmitter. It is available in used condition at hamfests and through equipment trader publications such as the Ham Trader Yellow Sheets. I found mine at a hamfest for $30 and have not regretted my purchase.

THE TPA•1

In early 1987, AMECO introduced the TPA-1 to replace the popular but somewhat limited PLF 2 model. In the early days of my experiments with impedance, matching a Beverage to a receiver, I contacted several radio amateurs specializing in 160 meter low band work. When on DX expeditions, most of these people use Beverages for reception. They strongly recommended the TPA-1 as a tuneable pre-amplifier which was useful with Beverage Antennas. Eventually, I purchased two TPA-1's and have had at least one in use for the past year.

The TPA-1 is a tuned RF pre-amplifier with frequency coverage from .22 to 30 MHz. A dual insulated gate field effect transistor is used in the amplifier circuit. The unit provides between 10 and 20 db of useable gain and seems to have a very good signal to noise ratio. The unit accepts a single antenna input (an RCA jack) and has a similar single output to a receiver. The TPA one requires 9vdc power from either an "AC adapter" or a 9v. battery. If battery power is selected, AMECO has provided an internal battery mounting clip and button snap terminal connectors. The AMECO designers have now added a gain control for the pre-amp to complement the two tuning controls found on the previous model.

Note the hinged telescoping antenna provided on top of the case. This antenna is activated when no antenna is connected to the rear chassis RCA jack. Thus, the TPA-1 does double duty as an active antenna.

The retail price in 1980 for the unit was about $75.00, with the adapter being available for anouther $7.50. It is available from a number of SW hardware outlets including Universal Shortwave in Reynoldsburg, Ohio.

IN USE:

I did not find the TPA-1 to be a satisfactory answer to my impedance matching problems with the Beverage - not when the unit was separated from the antenna by 70' of 50 ohm coax, anyway. However, I have found the TPA-1 nice to have around. It is excellent on DXpeditions, particularly when hooked to very directional low gain antennas such as the "Snake" (QST April 1988). I also find that the TPA-1 does help "strengthen the audio" on some marginal signals when listening to programming with one of my major DX receivers. This is especially true when I tune the higher Internationl Bands. I have only rarely found the TPA-1 to be of assistance when DXing weak signals with my NRD-525.

When I next travel to the Far East, I'll be taking my Sony 2010 and the TPA-1 to do both program listening and some very serious DX. I have found that the TPA-1 really helps the Sony, especially when using less than optimal antennas on the Tropical or Medium Wave Bands.

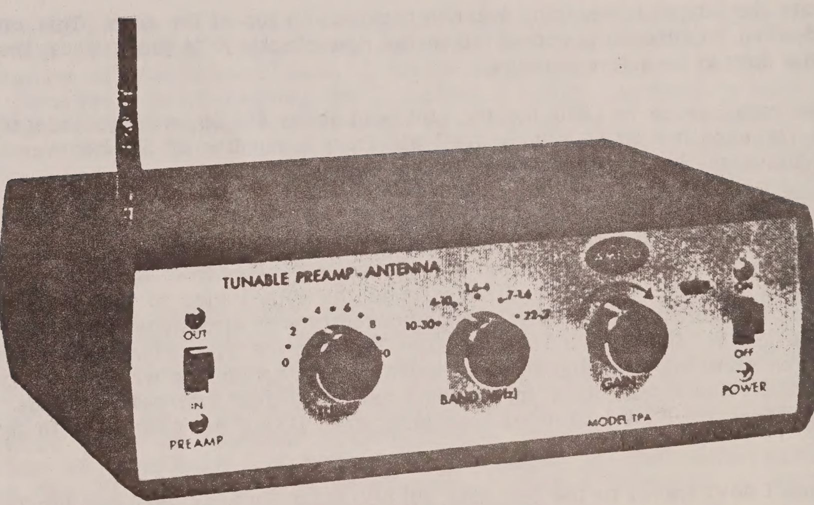
I might also note that the tuning of the TPA-1 amp is very sharp. I do not have instruments to measure it, but I believe that the amplified portion of the spectrum is little more than 10 KHz wide. However, even with that quality of circuit design, the unit does tend to overload the front-end of the 525 under some circumstances on the lower frequency bands. This is most often noticed during the day when my one local MW station is on the air.

ONE SERIOUS CAUTION:

The FET in the TPA-1 is EXTREMELY sensitive to static electricity brought to the unit via an antenna. In 13 months of operation, I have managed to blow three of these! They are not difficult to replace, if you know a little about soldering on circuit boards. Nevertheless, this tendency is a real pain in the posterior.

CONCLUSION

If your only mode of DXing is from your shack using a highly sensitive 'main line' DX machine with very high gain antennas, the TPA-1 will not help you much. However, if you do DXpeditions, or if you need something to give a less than 'mainline' receiver or a low gain antenna an RF boost, the TPA-1 is a very good choice.


TUNABLE PREAMP - ANTENNA
OUT
IN
PREAMP
0
2
4
6
8
10
10-30
4-10
1.6-4
.7-1.6
.22-.7
BAND (MHz)
GAIN
OFF
POWER
MODEL TPA

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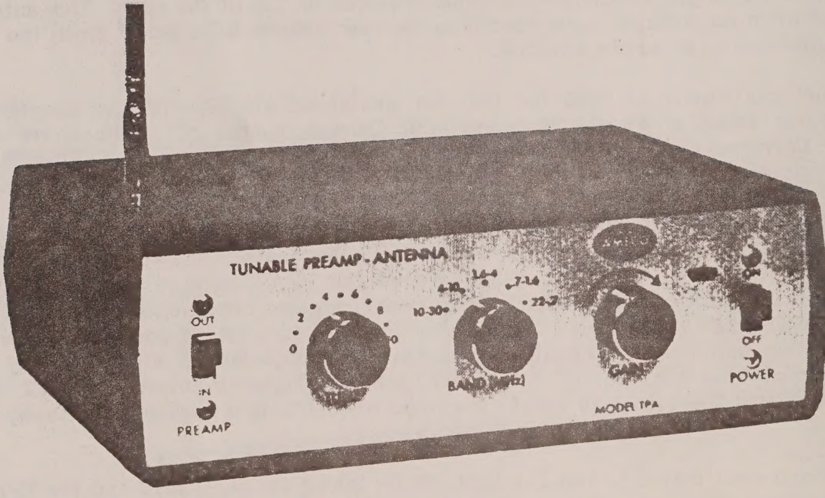
TUNABLE PREAMP-ANTENNA
OUT
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PREAMP
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2
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6
8
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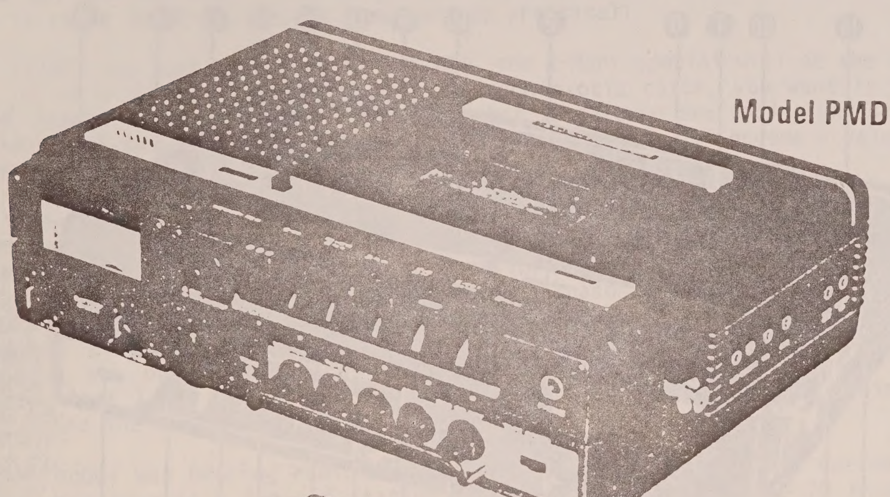
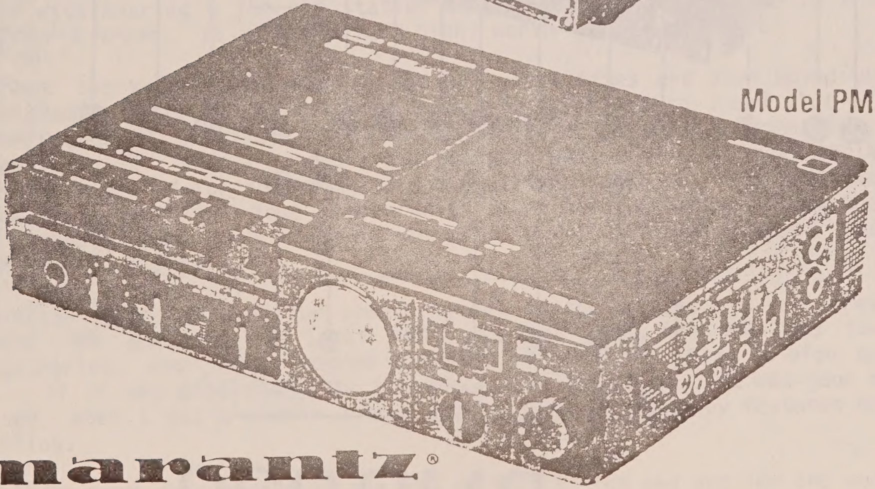
10-30
4-10
1.6-4
.7-1.6
.22-.7
BAND (MHz)
GAIN
ON
OFF
POWER
MODEL TPA

A CLOSE LOOK
AT
TWO OF THE BEST PORTABLE CASSETTE RECORDERS

FRITZ MELLBERG JOHN H. BRYANT R. CHARLES RIPPEL



Model PMD220

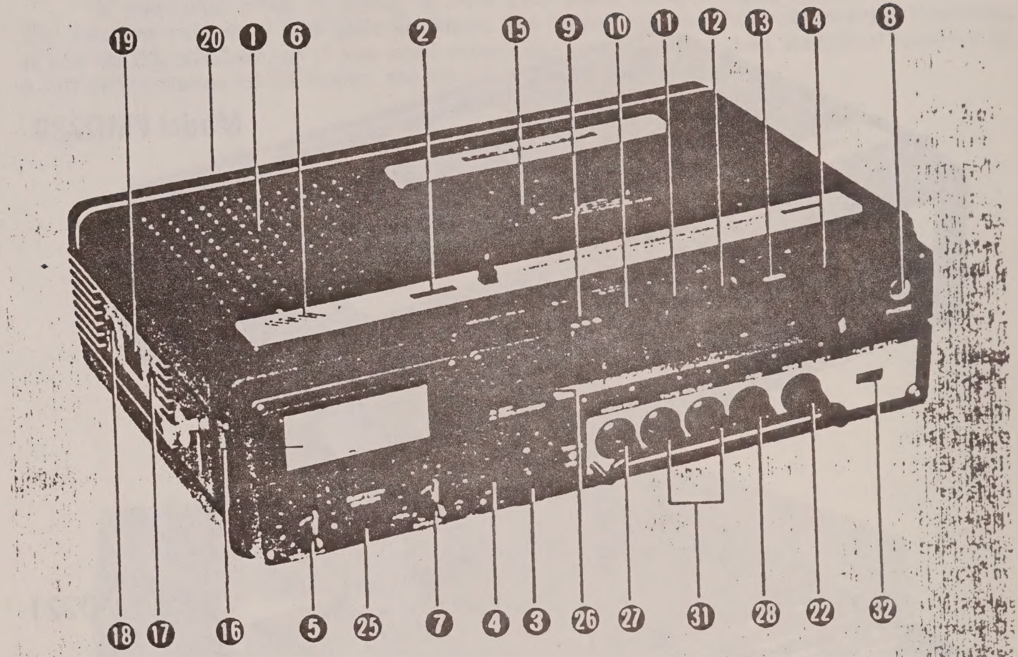


Model PMD221

marantz®

The following is a tripartite article. In the first segment veteran MW and SW DXer, Fritz Mellberg reviews the Marantz PMD-220. This recorder, discontinued by Marantz in about 1985, is often available at ham fests and is occasionally available on the used equipment market. In the second segment, John Bryant reviews the 220's replacement, the PMD 221 which he has operated for about two years. In the final segment of the article, Chuck Rippel details the very precise tests to which he subjected his own PMD 221 for publication in Proceedings 1988.

marantz®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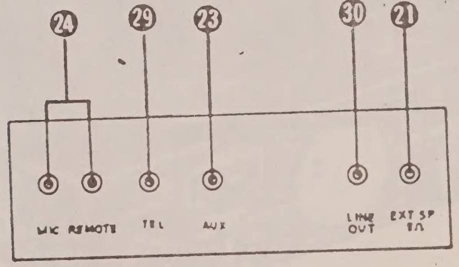

24
29
23
30
21
MIC
REMOTE
TEL
AUX
LINE OUT
EXT SP 8Ω

Model PMD220

PROFESSIONAL
PORTABLE
2-SPEED CASSETTE RECORDER

THE MODEL PMD•220

FRITZ MELLBERG

Why in the world would someone spend $200 on a tape recorder when $20 would get the job done? That might be a good question for an accountant, but when it comes to DXing, prudence may not be practical!

If all you want to record is the VOA, the K-Mart special will do the trick. But, if it's Radio Huanta 2000 or some such exotic catch, you want to hear every nuance of sound possible to catch that ID through the fading and static crashes. In this situation, the best possible recorder will become a valuable DX tool.

When I began DXing back in 1980, I decided for reasons of economy to avoid sending off for QSLs. At that time, I was a poor, starving DXer and had to watch my pennies. Spending $3 or more for registered mail to Bolivia was not my idea of a hobby. So, I bought a used Panasonic portable tape recorder to jack into my used FRG-7 and began to amass hours of audio on cassettes to get those elusive IDs. When I had time, I would edit those long tapes to eliminate all but the precious ID segments of my listening time. I soon realized that I was hooked on audio and was starting a collection of radio IDs from around the world.

My hobby was hearing radio stations; not collecting QSLs. I became obsessed with hearing a far off station and gleaning a discernable ID from the atmospheric trash. It is a glorious high, worth reliving on tape!

Over the years I upgraded my radio several times and even moved up to a decent Radio Shack CRT-50 recorder. But I still had to spend alot of time editing tapes to eliminate the long stretches of noise that come along with the periodic ID. When I landed a job teaching part time at a local college, I had to look around for something to spend all that cash on. Why not invest in a good tape recorder? Some stereo units might have worked well, but they are not portable, and they require another AM/FM receiver that I was not interested in buying.

After looking around for something out of the ordinary, I ran across the Marantz PMD series. A local radio station used the PMD 220 for its newsgathering, and their program director recommended it as a high quality unit. If it was good enough to provide air-quality tapes, it was good enough for me! When I got a closer look, I discovered it had many features helpful for DXing.

There were four models in the PMD series; a high end and low end model in both mono and stereo versions. I selected the high end mono, the PMD 220. The inexpensive versions come without the monitor tape head and array of filters. After four years of heavy use, I am still happy about paying the $179!

The PMD 220 has the usual complement of features found on other good portables--one touch record, cue and review, built in mic, rewind, fast forward, tone controls, total shut off, and so forth, In addition, it has two-speed record, a vu meter, one record/play, and one erase head, plus a third monitor head, an ambient noise control filter system, provisions for using LN, Chrome, or Ferro Chrome tape, plus high bias tape, memory rewind, line out jacks, a jack that allows recording off the phone, and various jacks and switches which make it very versatile. Optional accessories, such as a battery pack, make it an able companion on field trips. It can even be used as a small PA system or allow you to sing along with your favorite recorded Huyanos.

There are several features that are of interest to DXers. First, in addition to the traditional record/play and erase heads, there is a third head that allows one to monitor how well the signal is being recorded. An easy paddle switch allows one to switch back and forth between source and tape. When using this in conjunction with the various filters also available, it's fun to see the improvements you can make in the recording as you go along.

I do most of my listening with headsets, and I often listen through the recorder's audio system and use the filters to clean up noise. The sound is significantly better than with my R71A alone.

You can record in two speeds: the traditional 1 7/8 ips or a slower 15/16 ips. In addition, there is a playback speed control which allows one to vary the speed 20 percent faster or slower. This has been a great help in deciphering some troublesome IDs.

There are three ways one can record a signal, a cheap recorder offers only one. The better model will offer only two. The basic circuit gives automatic level control which boosts low volumes and limits high volume peaks. This does not provide for full dynamic range in recordings, however. A limiter mode cuts out any high volume peaks, but allows you to set the record level manually. A third mode allows full manual control of the recorder level without the limiter. This is the setting I use most often because it gives the best dynamic range.

The handiest feature by far with the PMD is the memory rewind. I could live without all the other gadgets, but I have grown very fond of this feature. When the memory rewind button is operational, pressing the rewind button will run the tape back to the 999 setting on the tape counter and stop.

When I make tapes, I record one catch, run a few seconds of silence, reset the counter to 000, and I'm ready to tape another catch without worrying that I'll erase the previous cut when I have to rewind again. As I am listening, I press record when I sense an ID is coming and I let the tape run. If nothing shows up, I press rewind, and it zips back to 999 and stops. It saves alot of effort!

Another helpful feature is the ambient noise control network. This system cuts off unwanted segments of the audio range at the flip of a switch. "Normal" allows full frequency response, "low cut" reduces boominess, and the third option eliminates both high and low ends. When I am taping a Peruvian in summer months, the third filter helps some; and when I am listening to something like Radio Cairo, with its poor modulation, the low cut filter helps some.

These filters are not the greatest, and they wouldn't be the reason to buy the recorder; but they are there, and they give a little help along the way. A simple equalizer used "in line" would help much more.

The unit weighs 7 lbs. 4 oz. without batteries; a little heavy for a portable! According to the service manual, the harmonic distortion of the recorded tape is less than 4 percent with Normal tape. Signal to Noise ration standards are greater than 43 db with AC supply and 47 db with batteries. These figures don't mean much to me, but they must be decent figures because it provides very clean and sharp audio; and that's what counts!

Power supply options are helpful, too. In addition to house current and four size "D" batteries for portable operation, there is an optional battery pack which reportedly gives great service. You can also operate the recorder from your automobile with the appropriate adaptor.

How does it fare overall? I rate it a B plus, even though my heavy record/rewind use has worn out the mechanical switches inside twice, necessitating a couple of repair bills. The slow recording speed is not as helpful as I thought it might be. At 15/16 ips, the audio quality is disappointing. I suspect that for Ute DXing, it might be satisfactory. The memory rewind feature, together with the high quality tape heads, make it well worth the money for serious tape collectors.

PMD220

GENERAL SPECIFICATIONS

Number of Semi-Conductors:	
Integrated Circuits	5
Field Effect Transistors	1
Transistors	7
Diodes	16
Unit Weight (without Batteries)	7 lb. 4 oz. (3.2 kg)
Dimensions (W x H x D)	11-1/2 x 3-1/4 x 7-11/16 in. (29.3 x 8.2 x 19.5 cm)
Power Requirements	
U/C Model	120 V, 60 Hz, 7 Watts
A Model	240 V, 50 Hz, 7 Watts
	Four "D" Batteries
	RBD-1 Rechargeable Battery Pack
	External 6 V DC

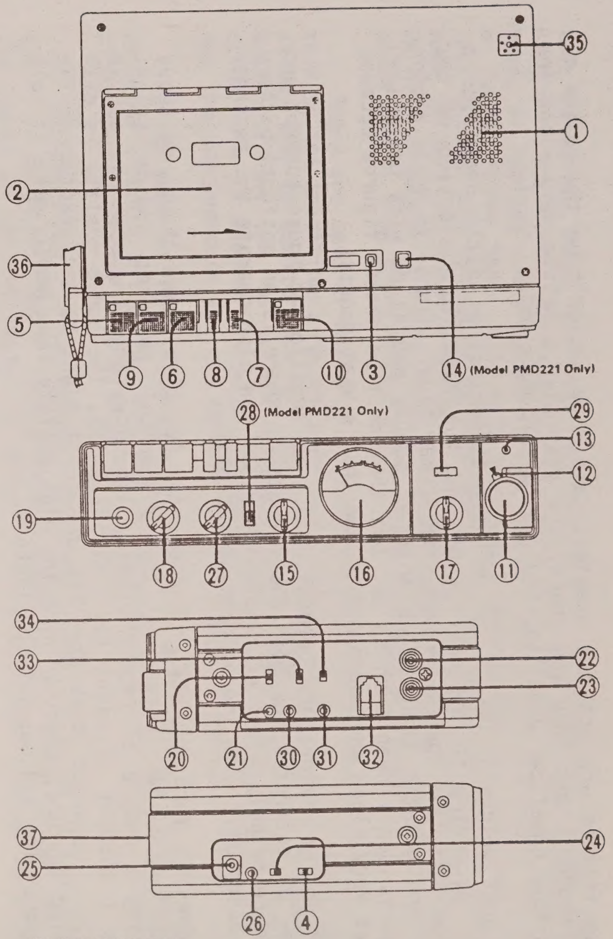
MODEL PMD221 TECHNICAL SPECIFICATIONS

Tape Drive System	Single Capstan Drive
Cartridge	Philips type compact cassette
Track System	2-track 1-channel
Tape Speed	1-7/8 ips and 15/16 ips
Heads	3 Head System
	Record: Super Hard Metal Alloy
	Playback: Super Hard Metal Alloy
	Erase: Dual Gap Metal Alloy
Motor	DC Servo Motor

Frequency Response:

	Standard Speed 1-7/8 ips (±3 dB)	Long Play 15/16 ips (±3 dB)
Normal Tape	40 Hz ~ 12.5 kHz	40 Hz ~ 6.5 kHz
CrO$_2$ Tape	40 Hz ~ 14 kHz	40 Hz ~ 7.5 kHz
Metal Tape	40 Hz ~ 15 kHz	40 Hz ~ 8.5 kHz

Signal to Noise Ratio:	
Normal Tape	55 dB
CrO$_2$ Tape	57 dB
Metal Tape	57 dB
Wow and Flutter (WRMS)	
Standard Speed 1-7/8 ips	0.12%
Long Play 15/16 ips	0.15%
Output Level/Impedance	
Line	650 mV/2 k ohms
Headphone	280 mV/8 ohms
Input Sensitivity/Impedance	
Line	40 mV/56 kohms
Microphone	0.3 mV/9 k ohms
General:	
Power Requirements	120 V, 50/60 Hz
Battery Requirements (RB430 Battery Pack Optional)	3 D Cells or RB430 Rechargeable Battery Pack
Battery Life	
With Alkaline Batteries	
Playback Time	7.5 Hours
Recording Time with Metal Tape	5.5 Hours
With RB430 Battery Pack (optional)	
Playback Time	4.5 Hours
Recording Time with Metal Tape	4.0 Hours
Unit Dimensions and Weight	
Width	228 mm (9")
Heigth	51 mm (2")
Depth	165 mm (6.5")
Weight	1.3 kg (2.87 lbs.)



NON OBVIOUS CONTROLS
4 - Tape Type Selector; 11 - Record Level; 12 - Record Indicator 13 - Low Bat. Indicator; 15 - Tape Speed; 18 - Output Level; 19 - Headphones; 20 - Attenuation; 21 - Mic; 22 - Line In; 23 - Line Out; 24 - Ext. Speaker On/Off; 25 - 4.5V DC Input; 26 - Ext. Speaker Out; 27 - Tone; 28 - Monitoring Source Select; 29 - Hi/Lo Tape Speed; 30 - Remote; 31 - Telephone In; 32 - Modular Teleph. In; 33 - Audio Filter Select; 34 - Input Port Select; 35 - Mic.

THE MODEL PMD•221

JOHN H. BRYANT

Two years ago my Sony/Superscope cassette recorder finally "went belly up" after almost a decade of heavy use. I had gotten a little lucky and had some spare cash for a change, so I decided that I wanted to get a VERY good cassette tape recorder. I wanted it to be a large portable with a Nicad pack because I was planning to get into DXpeditions in a big way. I also wanted it to be reasonably rugged 'cause the way that I DX tends to put a lot of stress on the gear. I happen to know some of the folks in network news, so I asked them what they used for remote work. The standard of the news industry used to be a Sony portable which retailed for around $500.00...beyond my price range. Luckily, my friends said that the machine of choice at this time was the Marantz 221, available for less than half that figure. I swallowed hard, and bought the darn thing. What's more, I forked over an almost incredible $49.00 for the Nicad battery pack and another $20.00 for a vinyl (vinyl!) carrying case. Was I nuts?? Heck, yes. Am I glad that I did it? You bet! The 221 has made more difference in my capabilities as a DXer than any other piece of peripheral equipment.

The older Marantz PMD 220 and its replacement, the PMD 221 are cousins with almost identical capabilities. However, as you can see from photos at the beginning of the article, the 221 is a completely new design - the layout of the instrumentation and controls is completely different, with the 221 having recessed controls and a "more modern" all black look. The 221 is also somewhat lighter weight and slightly smaller.

What do I like about the machine??

A) I like the fact that I can use any other function control while the thing is playing back- I can Fast Forward or more importantly, Fast Reverse while the recorder is in either the Record or the Play mode. I can even have the thing in Play Mode, push the Pause button to stop everything and then use Fast Forward and Reverse. Of course, as Fritz mentioned, the 221 also has the Memory Rewind feature. This is all incredibly handy while trying to decipher a difficult ID. By simply lightly touching the FR button (lightly so that it won't lock down) I have listened to a 5 second ID for 10 times in a row in an elapsed time of less than $1\frac{1}{2}$ minutes. THAT'S HANDY!

B) Like Fritz with the 220, I like the "Pitch" control which lets me vary the tape speed ± 20% to help decipher an ID or to compensate for having recorded the thing using a very under-charged battery pack.

C) Apparently the Marantz people solved the audio problems with the slow speed recording function of the 220, 'cause I cannot discern any audio quality loss with the slower speed on the 221, though I'm sure that there must be some. I'd use the 15/16 ips speed all the time but then my tapes wouldn't be compatible with most other folks or with most gear at stations. The obvious application for this capability is in timer driven "hands-off" DXing while asleep. Using the slow speed, I get 90 minutes of monitoring on one side of a C-90 tape.

D) I like the overall audio quality of the 221. The DX signals which make it to our receivers already have badly battered audio, so we need every bit of audio fidelity that we can get. Chuck Rippel's work at the end of the article and the 221's use in the broadcast industry both speak to excellent audio fidelity. I also like the on-board audio filtering. Three filtering settings are possible: "Normal" full audio spectrum, a "high cut" filter or a "high and low" cut filter. For DX work, I leave the filters in the latter position and it does help a good deal. (Refer to the test section by Rippel). I am also glad that I invested in the third head so that I can monitor what is actually recorded on the tape while the recording is being made. This also lets me hear the internally filtered audio, so I sometimes DX with the tape recorder in the headphone circuit.

E) The accessories which I purchased, the Nicad pack and the padded vinyl carrying case also turned out to be extraordinarly well conceived. The Nicad pack, which I have used extensively, seems to take and hold a charge much better than any other such battery pack that I have ever used. The vinyl carrying case is meant to protect the recorder WHILE IN USE in the field. It is so well designed that I leave the 221 in its case even while using it in the shack. The portability of the unit due to the extraordinary battery and case has led to all sorts of unanticipated uses from recording owl hoots at midnight in December, to taping business meetings. These accessories have both repaid their cost many times over in the two years I have owned them.

F) I also like the slide switch that lets me select between the three input ports while recording. I input the radio directly thru the "Line In" port. However, when I want to make a comment on the tape or state the time, etc, I just slide the input switch to "Mic" momentarily which activates a super sensitive on-board mike. Thats' alot handier than pulling and pushing plugs frantically.

G) I also like the 1/4" headphone jack. That's handier than the mini-jacks and, along with the battery pack and the case, tells me that I'm dealing with professional gear.

Thats about it on the plus side. There is an awful lot to love about the Marantz PMD-221.

What do I NOT like about the PMD-221? Just two things:

A) I hate the darn little slide switches on the right hand side of the recorder. These control the attenuation pad, the audio filtering and the input ports. These switches are just too small and too hard to see. Their size is no doubt a result of the whole miniturization trend of the electronic industry. I would have gladly accepted a recorder one inch wider and a few grams heavier to get these controls at a reasonable scale. The left side slide controls are also too small. They control the external speaker and tape type selection. Happily, all main controls are of good and comfortable size.

B) I am concerned about the speed control problems noted in Chuck's bench test. As Chuck presumed, I also think that the problem stems from the design feature which allows the operator to control the tape speed ± 20%. Frankly, I am not concerned about the .5% speed deviation and the mediocre wow and flutter numbers. What bothers me is that three times in the past year, the speed control on my machine has "gone nuts" and run the tape at two or three times normal speed! Each time this has happened, I have been able to "calm it down" by fliping switches back and forth a few times. This may be a peculiarity of my unit; I just don't know, but it is scary! However, I must have at least a thousand very hard hours on it and it is still doing well with no other problems.

Would I recommend the Marantz 221? Yes! It has given very good service and, with the extraordinary battery pack and carrying case has become a useful and incredibly flexible companion with many uses that I never anticipated when I bought it.

A TECHNICAL REVIEW
OF THE
MARANTZ PMD•221

R. CHARLES RIPPEL

The review panel of Fine Tunings Proceedings thought that a technical overview of the Marantz PMD-221 tape deck would be an appropriate accompaniment to the hands on review of the unit by Fritz Mellberg and John Bryant. While these tests are not nearly as permeated with level of procedure as say, an identical test done by Stereo Review, the figures produced are a result of the use of much the same type test equipment. In fact, if any readers are Hi-Fi enthusiasts and read such publications regularly, they will notice that the many of the test graphs are identical in format and basic content.

The conditions of the test are as follows:

Unit Under Test: Marantz PMD-221, serial number 6XU20034
Age: 7 Months

Test Equipment: Sound Technology 1500A, serial number 117-02312

Last Calibrated: October 1983 by Sound Technology

Standard Test Tapes:

Teac MTT-150, 200nWb/m to establish 0VU.

Teac MTT-111, 3Khz tone used during speed accuracy and wow & flutter tests.

Maxell UDXL II C-90, high bias blank tape premium tape for applicable record/playback tests.

Realistic "Concertape" low bias blank tape for applicable record/playback tests.

Test Weighting: NAB Standard.

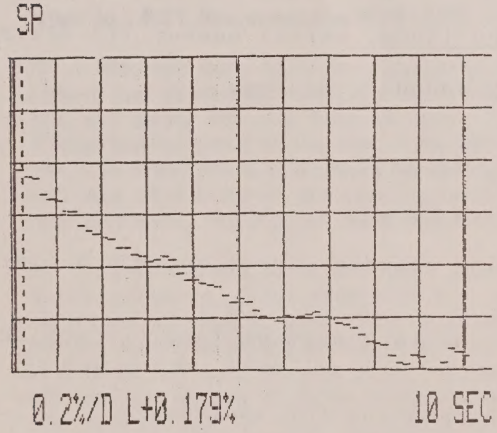
The use of Teac test tapes is fairly standard in the industry. Other manufacturers, such as Nakamichi, require use of their own tapes due their non-standard design approach to such things as playback equalization.

The testing was done at Audio Video Service Labs, Inc., here in Virginia Beach, VA, a factory authorized Marantz Service Center. Unfortunately, we were lacking service documentation for this current line model. This inconvenience is an unfortunate trend that consumer electronics suppliers must contend with these days. Since the owners manual contains no specifications, we have no "official" specifications to compare results with.

Adjustments or modifications made to the unit under test were limited to: cleaning the head, pinch roller and capstan along with a very necessary motor speed adjustment. An explanation of the reasoning behind the motor speed adjustment is noted in that section of this test report.

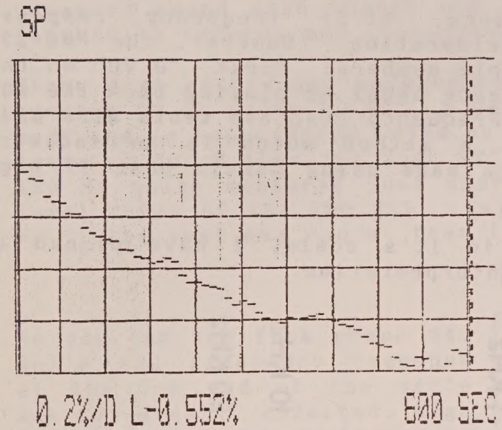
Speed Test:

This test is designed to detect both short and long term tape speed inaccuracies. It is performed by playing back the Teac MTT-111 3 khz test tape and monitoring the "line out" of the tape deck under test. The test is 600 seconds long.



Graph #1 represents test results after 10 seconds. Note the position of the dotted line. This was virtually the beginning of the test. The numeric figure in the bottom area of the graph to the right of the "L" shows the tape speed being about .179% fast as noted by the (+). An acceptable test would show the deck tracking speed basically along the center horizonal, 4th from the top, gradual.

Graph #1



Graph #2

Graph #2 shows the final result of the test. After 600 seconds, again note the position of the dotted line, the tape speed changed downward leveling off .552% slow. Again, note the sign in front of that number. This is unacceptable. Had I not had previous experience with other PMD-221's, I might consider replacing the motor on this unit. However, I know that motor design is perhaps the biggest flaw in the PMD-221. Speed inconsistencies plague the unit to the degree that changes could be noted if the set is even turned upside down. This was the case when I adjusted the motor speed of the unit in order to test it. Initially, the speed was so fast as to be beyond the ability of the Sound Technology 1500 to measure it. I set the speed nearly perfectly from the bottom of the unit but found when the unit was turned right side up for use, the speed changed significantly. Through a rather archaic process of turning the unit upside down for adjustment then right side up for measurement, I was eventually able to adjust the motor speed properly. During this process, I found that the unit would not return to the speed set once it was cycled off and on. Mind you the speed errors noted during the on/off cycling are not great and are perhaps inaudible by most. The results of this test do indicate a poor speed regulation design. Perhaps the design approach taken was necessitated by the "pitch" control on the front panel.

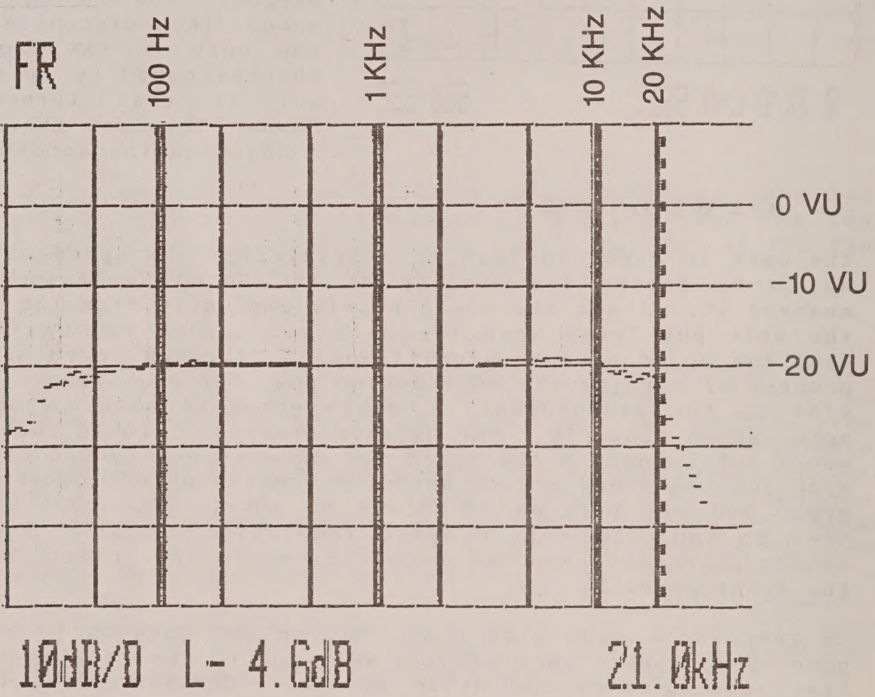
No tests were made with C-30, 60, or 120 formats to see if the poor speed consistency results were due to the varying lengths of tape loading down the drive system. Changing from DC and AC power was tried but yielded virtually the same results.

Wow and flutter was found to be a very mediocre .087%. Realize that .1% is considered unacceptable by most audio reviewers.

Frequency Response Test:

When used in SWL applications, HI-FI frequency response performance is not a prime consideration. However, the PMD-221 did turn out some very respectable numbers! First, "0 VU" on the unit was established as a reference level by playing back the 200 nWb/m Teac MTT-150 test tape. Frequency response tests were made -20 db down from this level, a method which is an industry standard. The first tests were made using Maxell UDXL II high bias "chrome" tape.

As this graph is logarithmic in it's scale, I have penned in limited numerics to assist in interpretation.

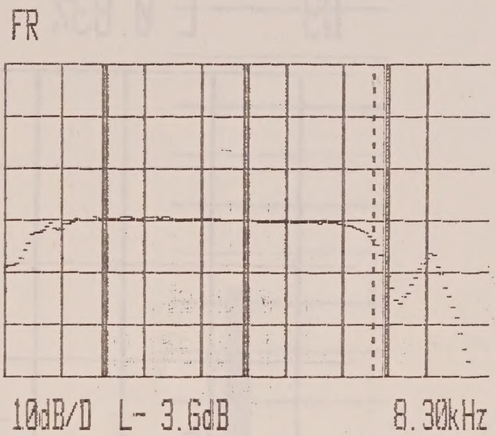


Graph #3

Graph #3 shows frequency response as measured between the -3 db points, an industry standard, to be about 31 - 20.5 kHz. This is excellent performance on a par with many expensive home units. Broad frequency response is a two edged sword and can be a liability in this application. DX'ers are primarily interested in the audio spectrum primarily centered on "voice" frequencies, 300 hz through 3 khz. Any other recorded sound, such as static, rumbles and receiver "shot noise" can be regarded as extraneous, unwanted sound even though our "high dollar" cassette recorder faithfully records and reproduces it.

Since most recordings made under "real world" conditions do not average 20 db below "0 VU", a second frequency response test was made and is represented below by Graph #4. During set up for the test, we found that the Teac MTT-150 produced an audio output of 460 MV which measured just short of the red area of the audio level meter of the PMD-221. Using 460 MV as a referance for "0 VU," the test was run at that level.

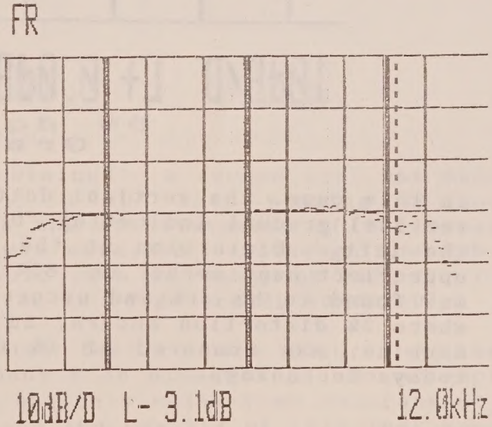
As you can see from graph #4, while the frequency response at the low end of the scale was not greatly affected, high frequency response suffered as a result of tape over-saturation. The 3 db points on this test occured at about 30 - 8.3 kHz. These are respectable numbers with the frequency response drop off attributable mostly to the slow, 1-7/8 IPS cassette format tape speed rather than a design shortcoming in the cassette deck itself.



Graph #4

Since many of us do not always use the more expensive high-bias chrome tapes for day to day recordings or for use as taped reports to broadcasters, I thought it might be interesting to run the same test with an expensive yet widely available low bias tape. Realistic "concertape" in the C-60 format was chosen.

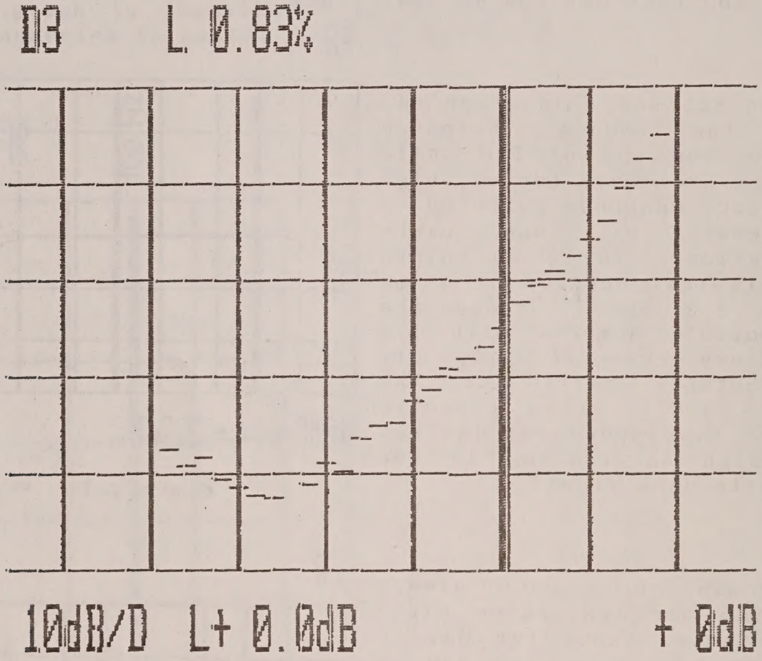
As illustrated in Graph #5, frequency response, although diminished at the high end, was a respectable 31 - 12.0 kHz.



Graph #5

3rd Order Distortion Test

This test measured the total distortion of the record/playback system. Graph #7 represents the results. Again, "0 VU" was used as a reference point. The test begins with a tone which starts 10 db stronger than "0 VU" and then steps down to -20 VU. The outcome of this test will vary with the type of tape. Maxell UDXL II was again used. As with most cassette recorders, one can expect worse results with low bias tape and even poorer results with "metal" formulated tape.

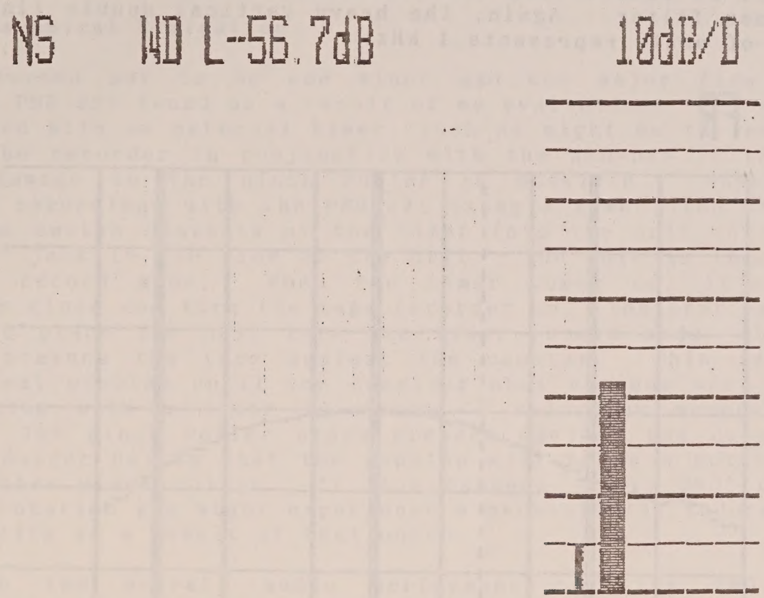


Graph #7

In this case, the vertical dotted cursor is hidden by the double vertical gradual indicating "0 VU" which is the 6th gradual from the left. Distortion at the "0 VU" point is indicated in the upper left hand corner as .83%. For our tests, distortion minima was found to be .1% and occurred -14 db from "0 VU." The point where 3% distortion occurs, an indication of the headroom of the machine, was measured at +6 db, an average figure considering todays technology.

Signal to Noise Test:

The signal to noise ratio, how quiet and free of both internal and externally generated noise a tape deck is can be one of the more important specifications. Graph #6 represents playback signal to noise ratio on an blank, unused tape as compared to the established "0 VU" level.



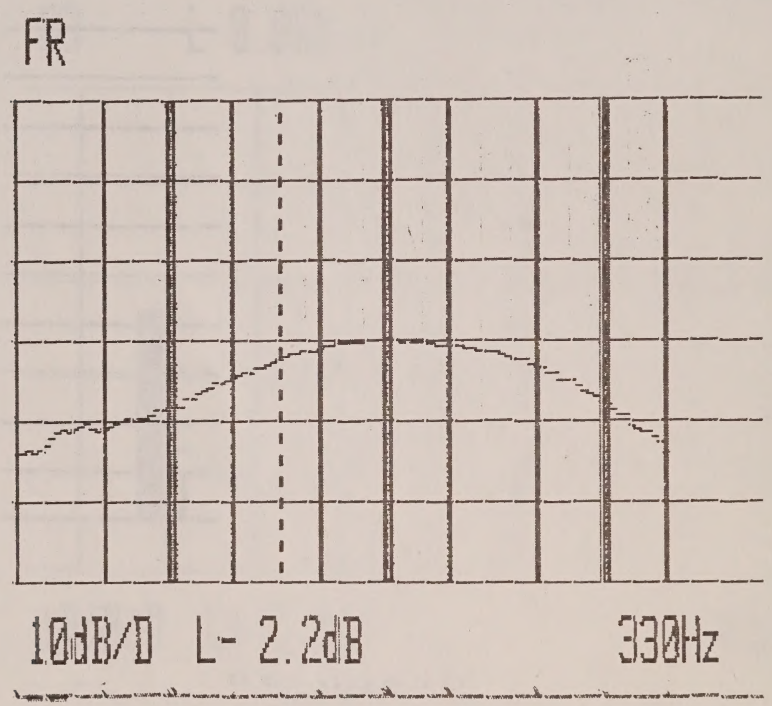
Graph #6

Here, a result of -56.7 db was obtained. A second test was made by recording a 460 MV signal, "0 VU" then erasing it and measuring the result which tests the effectiveness of the erase system. The same -56.7 figure was obtained. Although the PMD-221 has no noise reduction circuit such as dolby or DBX, it is quiet enough without those features to be generally acceptable.

A note about the signal to noise test. This figure may be considered accurate to within about 3 db either way. No attempt was made to make the test in an entirely noise-free environment. For those who may want to challenge the results of this test know in advance these conditions may have a slight influence on the outcome.

Other:

The Marantz PMD-221 has two additional audio inputs on the right side of the unit suitable for a telephone and external microphone. The inputs can be affected with a switchable -10 and -20 db pad, a band pass as well as a high pass filter. I thought it might be interesting to illustrate the characteristics of the band pass filter. Again, the heavy vertical double line in the center of scale represents 1 kHz.



Graph #8

The filter was found to be approximately a .5 db per octave filter centered on 1 kHz. It has a little over 1 db of attenuation at the edges of the "accepted voice band" of 330 - 3.3 kHz. It had about 13 db of ultimate rejection which occured at 20 Hz and 20 kHz. Not a very effective filter really but it might be just enough to eliminate some incoming extraneous noise.

The PMD-221 also has a switchable "record mode" selector enabling the user to set the record levels manually, engage a limiter circuit or ALC circuit. It was found that the limiter was especially effective clamping the signal quickly as it began to rise above 467 MV. This effectively kept the signal from exceeding "0 VU" but for a few milliseconds. The limiter might be especially effective for SWL's by setting the average record level just below "0 VU" and allowing the limiter to clamp any static crashes or other drastic changes in audio amplitude. I found the ALC mode unusable as it maintained audio input well over "0 VU" which resulted in a distorted recording.

Final Technical Evaluation:

There turned out to be one minor and one major flaw in the Marantz PMD-221 found as a result of my evaluation. I found that when used with an external timer, such as might be the case when using the recorder in conjunction with the NRD-525 in the timer mode, damage to the pinch roller is possible. When making delayed recordings with the PMD-221 using a timer, the user must plug the switch contacts of the timer into the unit through the "remote" jack in the side of the unit. The unit is then placed in the record mode. When the timer comes on, it's switch contacts close and turn the tape recorder on. The problem arises when you place the unit into the timer record mode, the pinch roller presses the tape against the capstan. This in itself is no real problem until you consider what happens when you set the system with a timer to record a selection several hours ahead. The pinch roller stays pressed against the capstan and a real danger exists that the capstan will press a notch in the soft rubber pinch roller. If this happens, every 360° of pinch roller rotation you might experience a mechanically induced speed abnormality as a result of that notch.

Although the overall audio performance of the PMD-221 is excellent, it's transport and supporting mechanism are it's most serious drawback. The basic audio performance is as good as found in many high priced home decks. The perspective buyer might first consider the problems encountered with motor speed drift and basic transport reliability before making a purchase decision.

AUDIO FILTERING

A VARIETY OF APPROACHES TO IMPROVED AUDIO

JOHN R. TOW

You are probably wondering why you need another gadget to use with your new 'super - rig'. Why must you stack outboard accessories atop that fine piece of equipment, and especially something that won't help it receive any better than it did without the new accessory? It is really quite simple - your fine piece of equipment truly has a terrible audio section, desperately in need of external improvement.

Let's face it, we SWL's and DXer's are not the prime market for receivers. The best receivers from Icom and Kenwood, for example, are merely receiver sections from their respective amateur transceivers. These receivers are not totally optimized for SWL/DXing, especially the Icoms. In fact, it is my contention that the Icom R70/71A receivers were designed by committees - and non-interactive ones at that. Let me explain.

My R70 had a boomy bass response on AM. A quick check of the RC time constant comprising the diode detector load (The product of the diode load resistor's resistance and the accompanying bypass capacitor's capacitance.), the audio amplifier's high frequency roll-off bypass capacitors, and the negative feedback components around the output amplifier shows that a strange dichotomy existed - a communications receiver with distorted audio driving a wide bandwidth, near hi fi, audio amplifier. The impedance levels were not matched between the diode detector's output, the remote controlled gain stage (volume control), and the power amplifier resulting in a low pass audio frequency roll-off beginning below 1,000 Hz! In fact, a 6 db peak at 120 Hz was noted, not bad for a 'Ghetto Blaster' but hardly fair for a communications receiver. The result is predictable: the tiring, boomy, and distorted audio that Icom is now famous for.

I did not intend to indict Icom; even Drake, Collins, and JRC receivers, as well as many others, can use some external assistance in the audio department. The simplest improvement has always been to add an external MFJ, Autek, or other audio filter to the receiver and go on. In the simplest analysis, distortion is additive as you cascade amplifier stages. Following a receiver output stage beset with it's own distortion and bandpass problems with an add-on device will add to the distortion as well as detract from the add-on filter's true capabilities by having to attempt to mask the receiver's poor audio response. This can be remedied in most cases by simply connecting your add-on filter through the record or line level output present on most modern receivers. Since most add-on filters are normally placed in the audio output or speaker lines, they typically have a voltage gain of one. Most communications receiver's record output is in the 50 - 100 mV range making an external variable gain stage mandatory to return the output level to normal headphone or speaker levels.

There is another alternative - try an equalizer and amplifier combination from your stereo or portable 'boom box'. Simply hook the equalizer between the record output of your receiver and the input of your amplifier. Set the lower frequency controls (<350 Hz) at maximum cut, the middle frequency controls (350 Hz < f < 3,500 Hz) at maximum boost, and the higher frequency controls (> 3,500 Hz) at maximum cut. I just have a 5 band equalizer from Radio Shack's bargain table fed through an old AR amplifier to an Advent speaker as a demonstration. My younger son's boom box works at least as well, especially if you do most of your DXing at night with headphones as many of us do. Don't be afraid to adjust the controls. Through experimentation you can optimize for the speech clarity you prefer. It can really help in IDing that weak one. You can even reduce the effects of static crashes.

Perhaps the most important aspect of using an equalizer and external amplifier connected to the record output is that it allows modification of the purest detected audio in your receiver. That is, the record output generally comes just after the detector and before the volume control and power amplifier. This is without doubt the cleanest audio one can easily obtain without the need for surgery.

I was able to run a simple comparison of the typical equalizers ability to notch or null a frequency. Using the 1 kHz band at maximum attenuation on a Radio Shack 31-2020A 10 band equalizer, I noted a rather broad 14 db deep null. Compare that with the sharp and tunable auxiliary notch on the Autek QF-1A which I measured to be 25 db deep. The main notch can be adjusted to yield 35 or more db of notch depth. The combination of both of the QF-1A's filters can yield a single frequency notch depth of over 50 db, if you need it! Needless to say, the typical equalizer cannot approach the QF-1A or similar filters in their ability to adjust to the frequency and then offer a very good notch depth. Since true IF notches that cover the entire IF passband seem to be practically a thing of the past, the external notch filter is the only help available to most of us for hetrodyne reduction. The equalizer does have its place in adjusting the audio response of your amplifier, however.

While you have your stereo involved in your DXing, try taping your listening sessions. I used to use throw-away cassette decks for my 'IDing' along with el-cheapo tapes. Try an inexpensive stereo cassette deck (I wouldn't use my best three head solenoid operated cassette deck!). They generally have a high frequency bias oscillator instead of the permanent magnet bias common to the throw-away decks, adjustable levels and level indicators, and noise reduction circuitry. I usually use mine straight - no Dolby. I have learned to use decent tape, with CrO types being the best. When I am heavily into DXing, I leave a cassette running at all times - you can always record over it later if you want. A fairly good recorder can be had for as little as $60 if you check the local or mail order audio emporiums. I used two Sharp RT-150's for a year or more each before giving them to my sons for their stereos - and they still work fine! Not bad for $60 each! (My sons have really abused them since, though thankfully no Twisted Sister!)

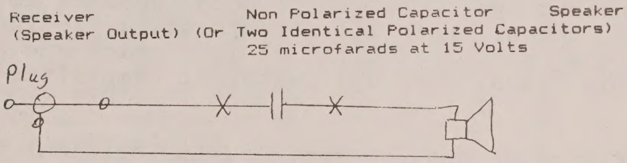
The best part about using an equalizer and a high fidelity amplifier is the amount of control you can have over the audio pass band. You can even listen in 'stereo' by using two receivers fed by different aerials for a form of space diversity reception. This method will allow the 'cerebral filter' to decode the stronger of the two signals, often permitting an ID to be made when normally one wouldn't be forthcoming. For a real 'treat', try the false stereo imaging, or wide-stereo, or IMX enhancement if your amplifier has one. These circuits present some strange mid-frequency phase shifting and recombination and can sometimes really enhance speech frequencies. At other times they sound a bit like a reverb, so beware!

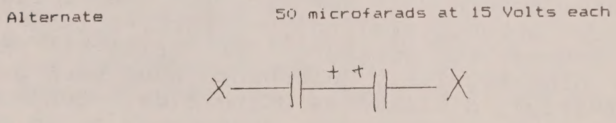
Suppose you don't want to spend big bucks on this audio tinkering - what can you do? Simple. Try using either a dedicated midrange type speaker or externally limit your speaker's low frequency response (This means you must use an external speaker.). I recently purchased a grab bag speaker from Radio Shack, a new replacement speaker for their Mach II's midrange, for $4. I have connected it through a 25 microfarad non-polarized capacitor (two identical 50 microfarad 15 volt polarized caps can be used if their positive terminals are connected together and the input and output connections are then made on the remaining two negative leads.) directly to the output of my R70. Instant speech response! Good riddance to low frequency distortion, though their ill effects still influence the remainder of the audio a bit, it is a quick and easy attempt at a cure. The equalizer and external amplifier is better - no doubt.

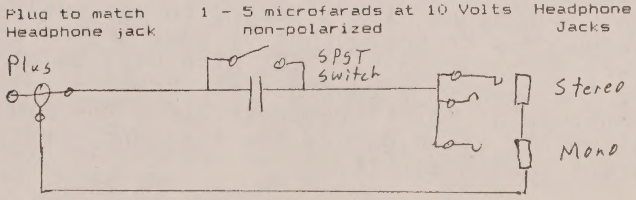
Most DXers prefer headphones to speakers for critical listening. Perhaps greater accuracy is embodied in the following statement: Most DXers' spouse, siblings, parents, friends, and even pets prefer headphones to speakers for critical DXing. Wide bandwidth, or high fidelity, headphones have been generally, and I feel unfairly, disliked as DXing aids. Connecting a pair of Koss PRO-4X or similar dynamic headphones to an unmodified R-70's headphone jack can result in a very bassy sound with a significant background hiss - tiring to say the least. Connect the same headphones to the output of your stereo amplifier and equalizer combination and the hiss will be all but gone with a flatter low frequency response to boot - all of this with the controls at 'flat' response. Peak the midrange response while rolling off the high and low frequency response to obtain the greatest speech clarity.

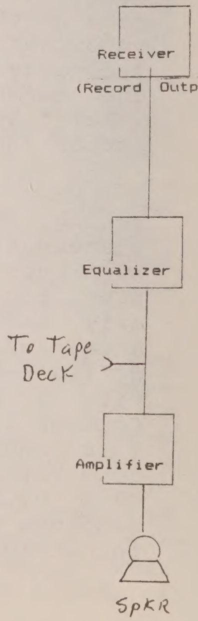
The same simple approach at limiting low frequency response of your external speaker can be attempted with your headphones. Simply make an extender or adapter cable with a plug to fit your receiver on one end of a 1-5 foot two conductor cord (Speaker cable will do nicely.) with the smallest Radio Shack plastic case on the other end. Mount an open circuit headphone jack to match your favorite headphones in the box. In fact, mounting a 1/4" mono, 1/4" stereo, and 1/8" stereo jacks in the box should cover most possibilities. Parallel both channels of the stereo jacks and connect one side of the cord to the outer or ring connection on the jack(s). The center, or tip, will be connected through a non-polarized capacitor to the other cord conductor. Use a smaller capactance than you did with the speaker. 5 microfarads should suffice for normal dynamic headphones with a lesser value, even as low as 1 microfarad, being required for the higher impedance 'Walkman' type headphones. Again, series connect two identical polarized capacitors of twice the aforementioned capacitances and rated at 10 V minimum if non-polarized capacitors cannot be found. Remember to connect the positive terminals together with the input and output taken from the remaining negative leads. A simple SPST toggle switch can be installed to short the capacitors to regain low frequency response.

The key here is simple - experiment! Don't blow out your favorite speakers or headphones when tuning across those strange utes with the audio gain wide open. Also, don't record over your favorite Twisted Sister or Cyndi Lauper tapes. Come to think about it - go ahead! Record over Willie Nelson as well! Don't erase that Andean flute music. Save room for that elusive 90 mb goodie - you never know when Tristan will sneak through ...


Receiver
(Speaker Output)
Non Polarized Capacitor
(Or Two Identical Polarized Capacitors)
25 microfarads at 15 Volts
Speaker
Plug


Alternate
50 microfarads at 15 Volts each
+ +


Plug to match
Headphone jack
1 - 5 microfarads at 10 Volts
non-polarized
Headphone
Jacks
Plug
SPST
Switch
Stereo
Mono


Receiver
(Record Output)
Equalizer
To Tape Deck
Amplifier
SpKR

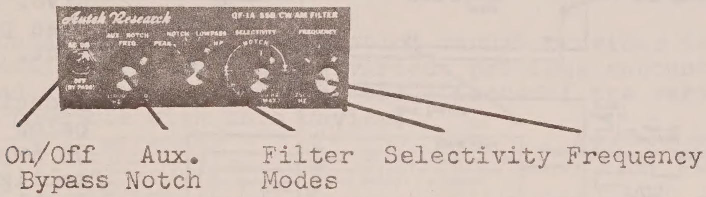
THE AUTEK QF•1A

AN ACTIVE AUDIO FILTER

JERRY STRAWMAN

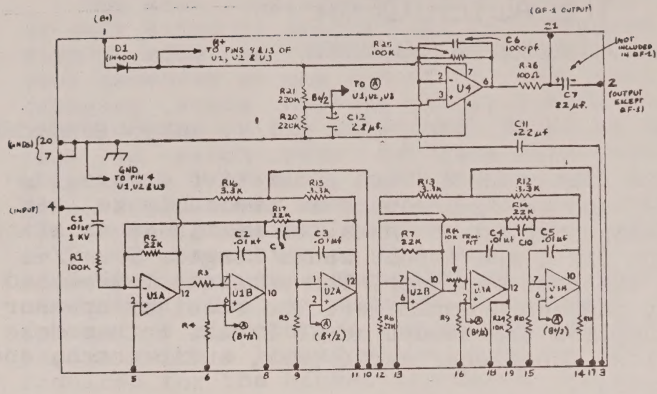
The Autek QF-1A audio filter is a third generation device, superceding models QF-1 and QF-2, produced in the early to late 1970's. The first design was to be installed within an existing receiver, between the first and second audio stages. The QF-1 received power from the host receiver. The subsequent QF-2 had its own power supply and audio amplifier. The receiver speaker or headphone jack supplied the needed audio input. Both models offered the same filter functions; audio peak, audio notch, and a lowpass audio response.

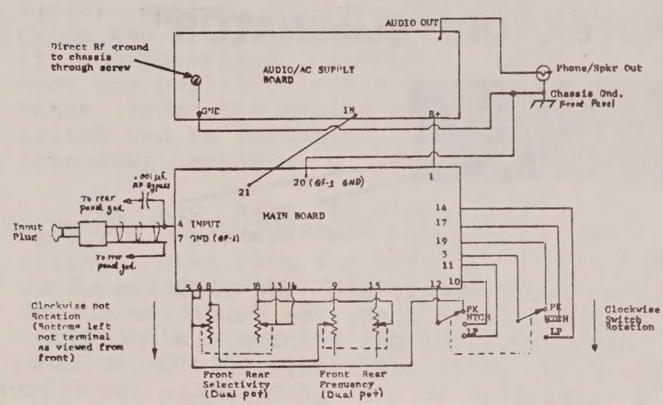
THE AUTEK "QRM ELIMINATOR"



The current QF-1A is an improvement, with the addition of a second notch and a highpass audio mode. The unit is enclosed in a metal case, 4" deep, 8" wide, and 3" high. The picture above illustrates the front panel controls. Audio input is by a shielded audio cable terminated in a ¼" phono plug. The filter output jack is a ¼" phone jack. Three integrated circuits comprise the heart of the filter. Two LM 348 quad op amps perform the filter functions, while an LM 380 power amplifier develops one watt of audio. The audio output is suitable for headphones and will drive a communications speaker to a room-filling level. The input level is controlled by the receiver volume control. The internal power supply accepts 117 volts. John R. Tow suggests that the QF-1A can be powered by applying +12 volts(negative ground) across the power supply filter capacitor. He has also noticed that there is AC leakage from the power line bypass capacitor. This results in a slight shock when plugging the QF-1A's input into a grounded receiver headphone jack. He indicates that the remedy for this problem is to isolate the receiver from the electric service ground and to ground the receiver through a separate ground rod.

Properly designed audio filters can improve the audio quality of any receiver. It can augment audio improvement functions that are designed into today's professional and semi professional receivers, as well as aid the radio listener who uses an inexpensive consumer-grade radio. The following schematics detail the design of the Autek QF-1. The design of the current model is similar, but uses different IC's .


(B+)
D1 (1N4001)
B+ TO PINS 4 & 13 OF U1, U2 & U3
R25 100K
C6 1000pf
(QF-1 OUTPUT) 21
(NOT INCLUDED IN QF-1)
R26 100Ω
U4
C7 22µf.
2 (OUTPUT EXCEPT QF-1)
R21 220K
B+/2
TO Ⓐ U1, U2, U3
R20 220K
C12 22µf.
C11 .22µf
(GNDS) 20 7
GND TO PIN 4 U1, U2 & U3
(INPUT) 4
C1 .01µf 1 KV
R1 100K
R2 22K
R16 3.3K
R15 3.3K
R17 22K
C2 .01µf
C3 .01µf
U1A
U1B
U2A
R3
R4
R5
(B+/2)
R13 3.3K
R12 3.3K
R14 22K
R7 22K
C4 .01µf
C5 .01µf
U2B
U3A
U3B
R9
5 6 8 9 11 10 12 13 16 18 19 15 14 17 3


AUDIO OUT
Direct RF ground to chassis through screw
AUDIO/AC SUPPLY BOARD
Phone/Spkr Out
Chassis Gnd. Front Panel
GND
IN
B+
.001µf. RF Bypass
To rear Panel gnd.
21
20 (QF-1 GND)
1
MAIN BOARD
Input Plug
4 INPUT
7 GND (QF-1)
To rear panel gnd.
14
17
19
3
11
12 10
5 6 8
18 13 16
9
15
PK NTCH LP
Clockwise pot Rotation (Bottom= left pot terminal as viewed from front)
Clockwise Switch Rotation
Front Rear Selectivity (Dual pot)
Front Rear Frequency (Dual pot)

The audio filter has an effect analagous to the use of an audio equalizer. It filters audio signals and can select or reject audio frequencies. I have found that an equalizer can be useful in peaking or reducing undesireable audio frequencies. Side-by-side comparison with the QF-1A shows that the latter is more versatile and more effective. Several examples point to this fact.

Reducing frequencies below 3500 Khz by 12 Db improves the intelligibility of the jumble of signals on 1340 KHz. The QF-1A highpass filter increases the effect further. In using the crystal filter on my Hammarlund HQ-150, the narrowest positions produce muffled audio. Again, frequencies below 3500 KHz are reduced on the equalizer to improve the audio, while the Autek highpass filter makes the recovered audio sound normal.

At various times, either RTTY or CW signals interfere with Kol Israel on 12077 KHz. Using the equalizer to reduce audio frequencies above 3500 KHz by 12 Db, the desired signal is more readable. The QF-1A lowpass filter carries the effect further and the auxilliary notch totally eliminates the offending signal. The BBC on 6005 KHz is the recipient of an annoying het from Costa Rica on 6006 KHz. The equalizer reduces the het to a tolerable level, while the Autek notch eliminates the heterodyne.

In general, the Autek highpass filter can eliminate or reduce 60 and 120 Hz rumble, low frequency hets from off-frequency signals, and clean up muddy audio. The effect is most apparent on receivers with mediocre selectivity. The lowpass filter is useful in reducing high frequency hiss, commonly encountered when receiving single sideband. The audio peak is handy to have available to lift weak CW signal from the background noise.

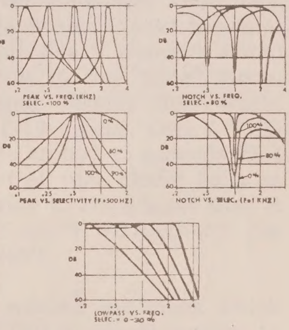
To my way of thinking, the notch function is the most useful. A notch is employed to reject a narrow band of frequencies. On the Autek QF-1A, the width of this narrow band of frequencies is set by adjusting the selectivity control. The center of the notch may be placed anywhere in the range of 250 to 2500 Hz. Most of the better communications receivers have a notch filter. In comparing the depth of the QF-1A notch to that of the Drake R7 and Icom R70, I find the Autek notch depth to be comparable, 30 to 40 Db. There are frequent occasions when a single notch will not do the trick. The two separate notch filters available on the Autek QF-1A can be used simultaneously with the receiver notch to eliminate strong hets, or be used independantly to reduce or eliminate up to three interfering signals.

Many radio listeners use a tape recorder to preserve their prized catches. Why not use this filter betweem the receiver and recorder to clean up the recorded signal; or between two tape recorders for the same purpose?

The manufacturer in the Autek operating manual provides the following suggestions for addressing various problems encountered. Also included are graphs depicting the effects of the various adjustments possible with this device.

CONDITION	USEFUL ADJUSTMENTS
Desired CW Signal	Peak. Adjust selectivity near full Clockwise (CW). Peak desired station using frequency control. Use as much selectivity rotation as required for conditions. Note that maximum selectivity produces the highest gain at the peak.
SSB, AM, CB, FM, or **broadcast** station. No **hetrodyne or** whistle.	Lowpass. Rotate selectivity 10% CW or as far as possible without producing audible ringing (not critical). Turn frequency control for desired rejection of high frequencies. Note: greater than 50% rotation makes signals bassy, because important voice frequencies are rejected.
Hetrodyne, whistle, TV oscillator radiation (buzzing noise), or code station interfering with desired signal. **Also for CB beats.**	Notch. Rotate selectivity 40% or more. Adjust frequency control to reject undesired signal. Large selectivity rotations yield the narrowest and shallowest notch; also the hardest to tune. Therefore, rotate selectivity no more than required to avoid rejecting the desired signal. Note: to help find the correct rejection frequency, it may help to momentarily switch to peak, peak the interference, then switch back to notch. The peaked signal is then rejected. A slight frequency touchup may help since peak and notch frequencies may not track perfectly.
SSB, AM, CB, FM or **broadcast station.**	Under some conditions the following may also be useful: 1. Peak. Selectivity 20% to 60% rotated. Frequency adjusted for best clarity. Sometimes very useful. 2. Notch. Selectivity 0% to 30% rotated. Frequency 0% to 20% rotated. Produces an extremely sharp cutoff of high frequencies. If a hetrodyne appears, you can quickly turn controls as above. Preferred by many CB and 160, 80, and 40 meter operators for voice reception.
Weak CW	An AC voltmeter or scope across the speaker or phones is a big aid in peaking an extremely weak signal, especially if he fades below the noise occasionally. Also, you can pick up 10 db or so in moonbounce if you use PDI, a pen recorder, and send at 3-4 WPM! See below.
Strong signal	A "flat" response is obtained in: 1) Lowpass. Selectivity 10%. Frequency 0%. 2) Notch. Select. 100% Freq. 0%. 3) Peak. Select. 0%. Freq. 40%.

A FEW OF THE INFINITE NUMBER OF RESPONSES



I acquired my used Autek QF-1A at a hamfest for $30. The filter is available new from the manufacturer, Autek Research, of Odessa, Florida for $79. Autek Research advertises in QST Magazine and the World Radio-TV Handbook. The device cannot eliminate all the problems encountered by the radio listener, however, I have found it to be an effective and reliable performer.

THE ULTIMATE SHACK CLOCK

JOHN H. BRYANT

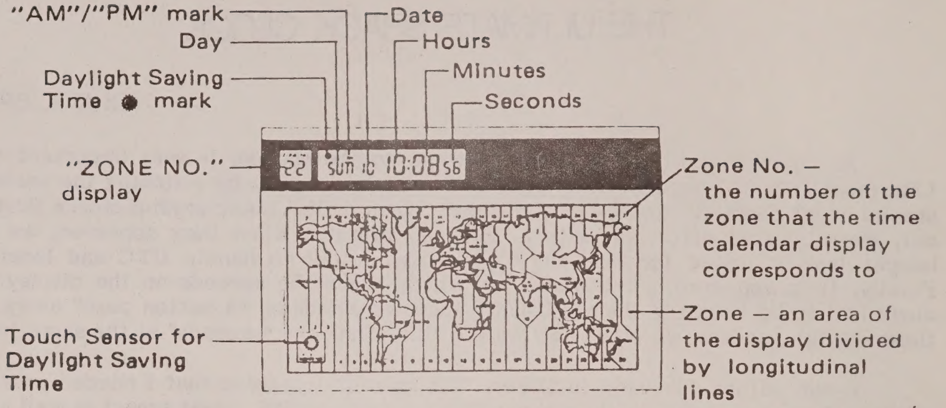
As an avid QSL hound, accurate time, **to the second,** is very important to me. Like most DXers, I need to anticipate ID'S and time checks by watching the second-by-second count down at "the top of the hour." When digital liquid crystal clocks first came out, we all lusted after one with a 24 hour format. When they appeared, we either bought two or lusted for one clock with dual output to handle UTC and local time. Finally, they appeared! But where, oh where, were the seconds on the display? The clock had to be counting them! Usually they were hidden, "a button push" away. With these digital wonders, we could not see the "time" and the "seconds" at the same time.

Once, rather too deep in DX'ers "tuning oil," I decided that I needed one digital clock that read at least six time zones (for my favorite DX target areas) as well as local time and UTC. It must (for sure!) continuously display the seconds, also. Some dream!!! No way!

Well, the next time that I was too deep in the old tuning oil, I noticed that Radio Shack was running a special sale on Micronta 1" x 3" digital clocks (cat.#63836A). They were about $7.00 each and would display in either 24 hour or 12 hour format. Like all the rest, they would either show you the time or display the seconds. With my usual clear thinking when experimenting with tuning oil, I decided that I would buy nine of these little beauties and mount them on the wall above my radio. I even made nice little signs saying "UTC" "LOCAL" "TOKYO," etc. At last, The Ultimate Shack Clock! Nirvana! Wrong, Buffalo Breath! The first problem was that those Radio Shack wonders would only display seconds for about 1 minute before defaulting back to the "time" mode. Drat! Should have checked that out. So, the continuous "seconds" display didn't work. Further, the manufacturers quality control was awful. Out of 10 clocks, ONLY TWO kept anything like accurate time (± 1 second per day). Most were around ±5 seconds PER DAY out of sync with reality!!! So, I had a choice: Either reset all nine clocks daily or put up with nine cheap little clocks, each rather randomly claiming to know what time it was. Obsessive/compulsive, YES, but I'm not totally nuts... THIS AIN'T WORKING!!! I'm out $70.00 and have two cheap clocks that work and seven that don't!

So back to the tuning oil!! What did I really want? I wanted one clock which showed me hours, minutes and seconds, at all times. I wanted this mythical wonder to tell me the time at any location on earth, even the crazy 1/2 hour time zones like India and central Australia. What's more, I wanted it to tell me the DAY and DATE at my target location, since I often forget the International Date line and UTC midnight and stuff like that. I also wanted it to handle Daylight Savings time, to hang on the wall and to be battery powered since my power mains here go out with some regularity.

I swear to you, not one week after dreaming up this performance specification, I was flying on business and found the clock advertised in the "In Flight" catalogue! It was the SEIKO WORLD TIME DIGITAL QUARTZ TOUCH SENSOR CLOCK, MODEL QNS901G. It is beautifully constructed of gold anodized aluminum and dark brown glass and measures approximately 8" w. x 5" h. It has a large electronically touch sensitive world map and a display made from 1/2" LED's. You simply touch your target area on the map and the display shifts automatically to the proper time, day and date at that location. The section from the instruction book shown on the next page covers most of the bases:

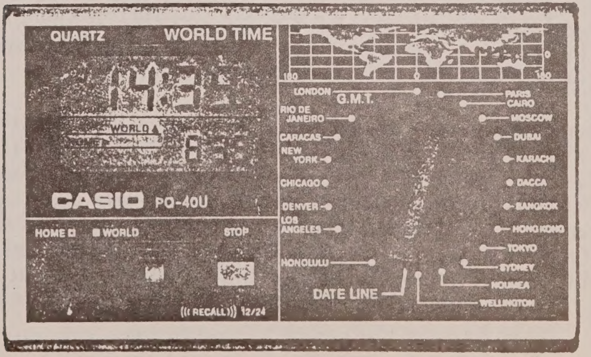

"AM"/"PM" mark
Day
Daylight Saving Time ● mark
"ZONE NO." display
Touch Sensor for Daylight Saving Time
Date
Hours
Minutes
Seconds
22
SUN 10 10:08 56
Zone No. – the number of the zone that the time calendar display corresponds to
Zone – an area of the display divided by longitudinal lines

You should note that the Ultimate Shack Clock will do everything that I dreamed of except hang on the wall. It comes with a plastic stand so that it will set on a desk with the face at about a 20 degree angle to horizontal. I was able to remove the face plate (containing all of the working parts except the time setting buttons and the batteries) from the under-chassis, and wall mount it, using some scraps of plywood, Velcro and good bit of ingeniuity. (PLEASE NOTE, this certainly voids Seiko's warranty and would probably send their engineers into convulsions!)

The suggested retail price of the Ultimate Shack Clock is around $90.00, but it can be had from the major electronics discount houses (47th Street Photo, etc) for about $70.00. The clock is my most valuable piece of peripheral equipment, simply because when I touch Laos on the world map it tells me that in Vientiane it is 21 April at 18:31:16 AND I KNOW THAT ALL OF THE INFORMATION IS CORRECT!

A VARIATION:

There are a number of versions of the clock pictured below currently on the market. They retail for anywhere from $23 to $40. Most of these have 24 position rotary switches to give you each of the 24 main time zones. I have noticed one Casio watch with the same capability and at least one "credit card" with 29 zones on it. Most of these little beauties will display the time (12 or 24 format) from two time zones simultaneously. One of the displayed times is a constant time zone (used for your QTH or for UTC) and the other display is controlled by the rotary switch.


QUARTZ
WORLD TIME
WORLD
HOME
CASIO PQ-40U
HOME
WORLD
STOP
((RECALL)) 12/24
180
0
180
LONDON
G.M.T.
PARIS
CAIRO
RIO DE JANEIRO
MOSCOW
CARACAS
DUBAI
NEW YORK
KARACHI
CHICAGO
DACCA
DENVER
BANGKOK
LOS ANGELES
HONG KONG
TOKYO
HONOLULU
SYDNEY
NOUMEA
DATE LINE
WELLINGTON

The limitations of these designs are that they usually DO NOT:

A) Display seconds
B) Deal with 1/2 hour zones
C) Give you day and date

In mid-1988 Casio introduced the World Time Watch ($39.95) with most of the capabilities and limitations of the "credit card" unit at the left.

THE HEATHKIT HO•13 HAMSCAN

ONE WAY TO WATCH YOUR RADIO

JERRY STRAWMAN

During the 1960's, Heathkit was heavily involved in supplying products to the radio amateur. The HO-13 Ham-Scan was one of their efforts. This device is a panoramic display, allowing the observation of received signals on a cathode ray tube. Its operation is similar to that of an oscilloscope.

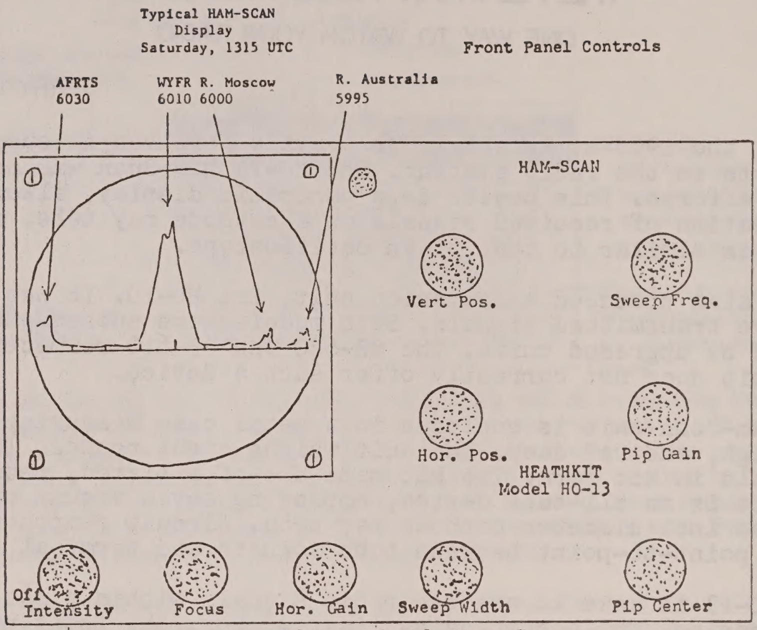
Heath also produced a companion unit, the HO-10. It was used to observe transmitted signals. Both models were subsequently replaced by upgraded units, the SB-620 and SB-610 respectively. Heathkit does not currently offer such a device.

The Ham-Scan unit is enclosed in a metal case measuring 7½" wide, 5½" high, and 9½" deep. The unit weighs eight pounds. The HO-13 was sold in kit form. The kit made use of a plated, metal chassis. It is an all-tube device, employing seven vacuum tubes and a three inch diameter cathode ray tube. Circuit components are wired point-to-point between tube sockets and terminal strips.

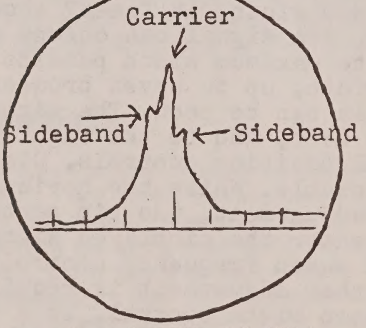
The HO-13 is used to observe radio signals within a set range of frequencies. The accompanying diagram shows the front panel controls. The sweep width control determines the width of the spectrum that is to be viewed. At minimum width, it "sees" about five KHz. At this setting, however, one signal can occupy the entire display. Setting the control to maximum width permits a view of 60 to 70 KHz. At maximum width, up to seven broadcast band or 10-12 high frequency signals can be seen. The signal display may be moved up, down, to the left, and to the right by employing the vertical and horizontal position controls. Display brightness and focus are also adjustable. While the horizontal position control acts as a coarse adjustment, the pip center allows the operator to precisely center the displayed signal. I have set the horizontal gain and sweep frequency controls for the best-appearing display. No further adjustment is required. Mounted concentrically with the sweep width control, is a switch that allows the introduction of an avc circuit. This circuit functions like your receiver avc. Its use smooths out the rapid up and down movement of the displayed signal which is influenced by signal propagation.

The cathode ray tube displays a signal as a bell-shaped tracing, similar to plottings of receiver i.f. filter responses. The size of the display is proportional to signal strength. Both sidebands, if transmitted, and the signal carrier are shown. The diagram page depicts several typical display tracings.

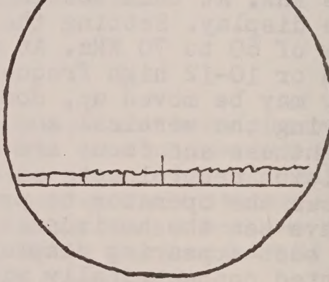
How can the amateur or radio listener make use of the Ham-Scan to increase enjoyment of the hobby? The amateur can observe incoming signals to see if certain signals are too broad, and a source of splatter. A search of nearby frequencies for unoccu-


Typical HAM-SCAN
Display
Saturday, 1315 UTC
Front Panel Controls
AFRTS
6030
WYFR R. Moscow
6010 6000
R. Australia
5995
HAM-SCAN
Vert Pos.
Sweep Freq.
Hor. Pos.
Pip Gain
HEATHKIT
Model HO-13
Off
Intensity
Focus
Hor. Gain
Sweep Width
Pip Center

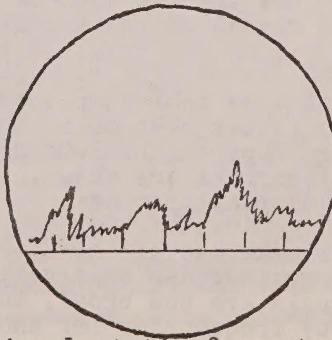
Heathkit HO-13 Ham-Scan


Carrier
Sideband
Sideband

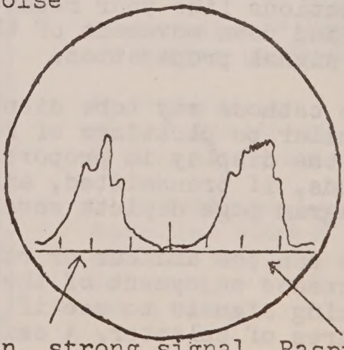
Strong signal-WWV 15 MHz



No signal-ripples show atmospheric noise



No signal-static from storms

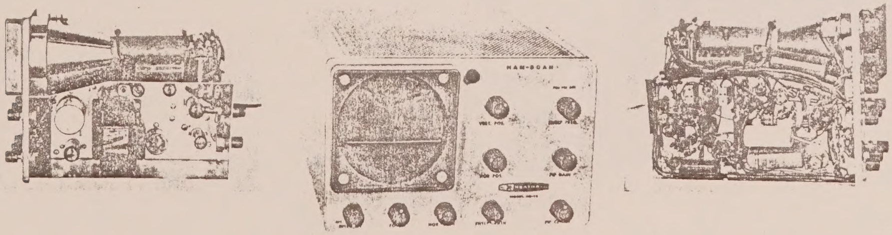


Clean, strong signal Raspy CW

pied spectrum can help in conducting interference-free conversation. I use the HO-13 for two reasons: 1] To search for signals in the tropical bands. The Ham-Scan will indicate the existence of signals too weak to produce audio. If the identity of the signal is unknown, one can wait to see if audio develops; 2] To check for "split frequency" signals on the broadcast band. I have observed signals on 535, 555, 655, 705, 765, 774, 834, 895, 1035, 1134, 1165, and 1179 KHz, when little or no audio was present.

The HO-13 Ham-Scan is connected to a receiver at a point immediately following the mixer stage and preceeding the first i.f. circuitry. Heath designed this device to accomodate first i.f. frequencies between 455 and 3340 KHz. At the point of connection, the signal has not been influenced by i.f. filters or the avc circuit. I.F. frequencies in the range described were commonly employed in receivers of tube-type design, and Heath products at 3340 KHz. By replacing several resistors and capacitors, and retuning an adjustable inductor, the Ham-Scan could be set to function with receivers of various manufacture. Due to design limitations, the Ham-Scan will not work with recent upconverting receivers that employ i.f. frequencies in the 35 to 72 MHz range. A construction article on page 43 of the September, 1973 QST Magazine, describes an i.f. converter. This circuit converts high i.f. frequencies to 455 KHz, which is compatible with the HO-13. The article claims that the converter can be made to work at any i.f. frequency, simply by changing the converter local oscillator frequency. The experienced experimenter might want to give the circuit a try.

Finding a used HO-13 Ham-Scan in any condition takes time. Persistence in checking the usual sources of radio equipment will likely turn one up. The price for this device seems to be in the range of $40 to $50. The HO-13 can add a little spice to radio listening and also provide a few more knobs to twiddle. The Ham-Scan was reviewed in the September, 1965 issue of CQ Magazine. The Heathkit HO-10 Monitorscope was covered in the June, 1964 CQ, page 37.



The Heathkit HO-13 Ham-Scan

computers

MINIPROP 2 AND LOWBAND DXING

A REVIEW OF TWO PROPAGATION PREDICTION COMPUTER PROGRAMS

MITCHELL A. SAMS

MINIPROP2 and LOW BAND DXING are two separate software packages that provide very helpful technical assistance to the hobbyist. Range, bearing, grayline existance, and signal strengths between any two points on the globe can be predicted. One wouldn't necessarily rely on these two programs on a day-to-day basis, but they can be useful when targeting a specific geographical area or frequency band.

I find these two programs to be most useful for pinpointing a frequency band at the time when it is about to exceed the minimum or maximum usable frequency. If you search in this area, which I will refer to as the "fringe", you may have a chance to hear a station at a time and/or on a frequency that is not normally possible. This "fringe" area is not always on a grayline and would therefore probably be difficult to predict with something like the DX EDGE.

A few examples of "fringe" DX, all logged here in the central US in the past few years: Kiribati on 14802 at high noon (1800 UTC), a 75 meter band North Korean regional at midnight (0600 UTC), 60 meter Indonesians in the afternoon (2200 UTC), the Indian subcontinent & Sri Lanka on 60 meters at sunset (0000 UTC), East Africans on 60 and 49 meters (including Mauritius on 60 meters) at mid-morning (1400-1500 UTC), Bolivia and Peru on 31 meters around noon (1700-1900 UTC), and 49 mb harmonics from Latin America just above 30 MHz at 2300-0000 UTC.

How can these two programs help you? Well, it is true that we all develop a feel, or an instinct, for when and where to look for excitement on the bands. But on several occasions I have stumbled upon real DX at an unusual time or on an unusual frequency, quite by accident. I've found, for example, that the unusual occurances mentioned in the previous paragraph were all predictable to some degree or another with LOW BAND DXING and MINIPROP2. Had I had access to these accurate prediction tools and the "a priori" knowledge which they contain, I might have been alerted to the unusual conditions in advance.

Now, a brief look at these two computer programs.....

LOW BAND DXING

The very fine book, "Low Band DXing" and these two disks of mini-computer software were written by John Devoldere (ON4UN of Belgium). The LOW BAND DXING programs focus on calculating astronomically related conditions like sunrise, sunset, Great Circle bearings, distances, graylining, etc., and on various areas of antenna system design.

More specifically, the astronomically related subprograms available within LOW BAND DXING are:

Sunrise/Sunset Times
Listing Sunrise/Sunset Times
Sunrise calendar
Great Circle Dir/Dist.
Listing Great Circle Dir/Dist
Grayline paths

The sunrise/sunset times for the entire year can be calculated for any lattitude and longitude on the globe. Once done, you have a permanently useful list that is accurate year in and year out, as long as your QTH remains fairly constant. In this particular subprogram, the times are listed in increments of one half month. The sunrise calendar lists sunrise/sunset times for a given QTH in any calendar increment specified by the user. LOW BAND DXING also has an atlas data base containing some 500+ locations across the globe. The option exists to list the sunrise/sunset times for all 500+ locations for a given day. Fig. 1a. shows a partial listing of sunrise/sunset times for Wichita. Fig. 1b shows sr/ss times for Wichita compared to Jakarta, Indo.

Great circle directions (bearings) and distances can be calculated (in miles and kilometers) between any two locations on the earth. The option also exists to list great circle distances and directions from your location to all 500+ locations contained in the atlas data base. This program is very useful for orienting antennas and appears to be potentially very useful in such bearing and distance oriented DX strategies as "Zonal Analysis". See Fig 2a.

The grayline subprogram calculates the start and end times of the overlapping grayline period as well as the width of the grayline zone for a specified target location. The user can supply a minimum target distance to suppress listings of stations close to your location. ON4UN is one of the pre-eminant authorities on graylining. This program even takes into account the fact that the grayline zone varies in width both with the season and with your placement on the globe. If you are interested in graylining, this program appears considerably more useful than such tools as the DX EDGE. See Fig 2b. min/targ is the grayline width in mins.

Finally, you should note that it is fairly easy to edit the "500+" locations of the data base to suit your particular needs. Using your wordprocessing program, you can access the data base (named SPOTS.DAT) and add or subtract locations at will. For instance, if you are primarily interested in East Asian DXing, you could delete all other locations and add in a number of additional locations in China, Indonesia and Southeast Asia.

Admittedly, much of the above propagation-related information can be ascertained through the mechanical use of the DX EDGE, in itself a valuable and highly recommended aid. But, it's useful in many cases to have the flexibility, accuracy and added features of the LOW BAND DXING program.

I won't go into any detail about the antenna design subprograms, (there are 26 of them on the two floppy disks) except to say that the capability exists to predict the following: (1) antenna radiation patterns, (2) interaction between terrain

```
COUNTRY: USA
CITY : Wichita
CALL :
LATITUDE NORTH :   37.41
LONGITUDE WEST :   97.2
MONTH/DAY         SUNRISE        SUNSET                   AUG/ 19        11.48        01.17
---------         -------        ------                   AUG/ 24        11.52        01.10
JUL/ 15           11.20          01.50                    AUG/ 29        11.56        01.03
JUL/ 20           11.23          01.47                    SEP/ 3         12.01        00.56
JUL/ 25           11.27          01.43                    SEP/ 8         12.05        00.48
JUL/ 30           11.31          01.39                    SEP/ 13        12.09        00.41
AUG/ 4            11.35          01.34                    SEP/ 18        12.13        00.33
AUG/ 9            11.39          01.29                    SEP/ 23        12.17        00.25
AUG/ 14           11.44          01.23                    SEP/ 28        12.21        00.18
```

FIG.1a PARTIAL LIST OF SR/SS TIMES FOR WICHITA,KS

```
                      13.43    23.21    JAN 1     22.44    11.12
WICHITA               13.42    23.34    JAN 15    22.50    11.17     JAKARTA
OWN QTH               13.33    23.51    FEB 1     22.56    11.19     TARGET QTH
-------               13.18    00.08    FEB 15    22.59    11.18     ----------
LONG =   97.2         13.02    00.21    MAR 1     23.00    11.14     LONG = -106.4
LAT. =   37.41        12.40    00.36    MAR 15    22.59    11.08     LAT. = -6.1
                      12.16    00.5     APR 1     22.57    11.01
===========>>>        11.54    01.04    APR 15    22.55    10.54     <<<==========
                      11.35    01.17    MAY 1     22.55    10.49
                      11.20    01.30    MAY 15    22.55    10.46
                      11.10    01.43    JUN 1     22.58    10.46
                      11.07    01.51    JUN 15    23.01    10.48
  TC TIMES            11.11    01.54    JUL 1     23.05    10.51
                      11.20    01.50    JUL 15    23.06    10.54
                      11.32    01.38    AUG 1     23.05    10.56
                      11.45    01.22    AUG 15    23.02    10.56
                      11.58    01.00    SEP 1     22.55    10.55
                      12.10    00.38    SEP 15    22.48    10.52
                      12.23    00.15    OCT 1     22.40    10.49
                      12.37    23.53    OCT 15    22.33    10.47
                      12.52    23.33    NOV 1     22.29    10.48
                      13.08    23.19    NOV 15    22.27    10.51
                      13.23    23.12    DEC 1     22.29    10.56
                      13.36    23.12    DEC 15    22.35    11.03
```

FIG.1b COMPARISON LISTING OF SR/SS TIMES FOR HOME AND TARGET QTH

```
                 GREAT CIRCLE DIRECTIONS AND DISTANCES               by   ON4UN
-----------------------------------------------------------------------------
THE TARGET LOCATION CAN BE SPECIFIED BY COORDINATES IN DEGREES PLUS CENTIDEGREES
(e.g. 3 deg 45 min East TO BE ENTERD AS -3.75) OR BY COUNTRY OR CITY NAME.
ONLY THE FIRST FEW LETTERS OF THE COUNTRY OR CITY MUST BE ENTERED. THE NAMES ARE
PART OF A LARGE DATA-BASE CONTAINING OVER 500 LOCATIONS WORLDWIDE.
-----------------------------------------------------------------------------
                                        OTHER STATION
OWN STATION                             -------------
-------------                           LATITUDE IN DEGREES NORTH > ? -6.1
LATITUDE IN DEGREES NORTH > ? 37.41     LONGITUDE IN DEGREES WEST > ? -106.5
LONGITUDE IN DEGREES WEST > ? 97.2


DIRECTION TO TARGET =   319 deg
DISTANCE  TO TARGET =   15775  km.
DISTANCE  TO TARGET =   9804   miles.
```

FIG. 2a GREAT CIRCLE DIRECTION/DISTANCE FROM WICHITA TO JAKARTA

```
YOUR LATITUDE IS 37.41 DEG. NORTH        YOUR LONGITUDE IS  97.2  DEG. WES
TIME OF YEAR (MONTH/DAY) =  3 / 20
YOUR SUNRISE IS AT 12.33 UTC             YOUR SUNSET IS AT 00.40 UTC
GRAY LINE WIDTH IS  25  MINUTES.         MINIMUM TARGET DISTANCE IS  2000 MILES
-------------------------------------------------------------------------------
PREFIX   COUNTRY          CITY           MILES   START   END    MIN/TARG
------   -------          ----           -----   -----   ---    --------
3Y       PETER 1ST ISL.                  7341    00.27   00.53     80
3Y       PETER 1ST ISL.                  7341    12.20   12.39     80
4S       SRI LANKA        COLOMBO        9362    12.42   12.46     20
9N       NEPAL            KATMANDU       7931    12.20   12.39     20
A5       BHUTAN           THIMBU         7924    12.20   12.22     20
CE9..8J  ANTARCT.         DAVIS          10270   12.29   12.46     79
CE9..8J  ANTARCT.         BYRD           8156    12.20   12.46    172
CE9..9J  ANTARCT.         MIRNYY         10378   12.20   12.44     71
UA9-0    AS. USSR         NOVOSIBIRSK    6047    12.20   12.46     46
```

FIG 2b PARTIAL LIST OF GRAYLINE TARGETS FROM WICHITA ON MARCH 20

extension of the ECOF and FMUF out to a point of lower probability.

I am much more interested in the region just below the ECOF, since in several cases that falls into the tropical bands. However, with the increase in the sunspot number we will see more activity at higher frequencies as the FMUF moves higher. This opens up the possibility of SWBC harmonics up to and exceeding 30 MHz, and European TV audio at slightly higher frequencies than that.

Figure 3 is an example of the FMUF/ECOF graphs that are output from MINIPROP2. The horizontal axis is the first two digits of UTC time, in 2 hour increments. The vertical axis is the frequency in MHz, at 2 MHz intervals. The X's represent the predicted FMUF while the O's represent the predicted ECOF. The hand drawn line over the ECOF in fig. 3a is my method of simplifying the graph so that I can see at a glance what the minimum usable frequency is. The trailing marks on the lower part of the ECOF graph represent the "fringe" area of interest for DXing Indonesia in my local mornings. Notice that the ECOF exceeds the FMUF up till about 0900 UTC.

Fig. 3a represents conditions from Wichita, KS to Jakarta, Indonesia for a given sunspot number in October. Fig. 3b is the same path from Wichita to Jakarta for a similar sunspot number, but occurring in June.

Fig. 4a explains one reason for the "impossibility" in logging Tristan here in the US, the ECOF is way too high during their broadcast period. Fig. 4b says that Greenland should be a fairly regular catch in North America. This is a good example of why one should not rely on propagation prediction too much. There are other factors such as transmitter power output, antenna beam heading and noise sources which are not brought into play here.

DX Compass - This feature graphically depicts the highest freqencies that are most likely to be open for DX in several directions from a specific location and at a given time of the day. An ECOF graph would have been very useful but that is not currently available.

Change options. Allows the user to: vary the frequencies used in signal predictions, vary the antenna minimum radiation angle, suppress the output of low signal levels, suppress the output of signal levels at frequencies higher than the predicted F2-layer maximum usable frequency, change path (short or long) to be computed first, or restore the original set of miniprop defaults.

MINIPROP utilities. This is a well thought out feature. It allows the user to create or modify the default QTH; add, modify, delete or display entries in the MINIPROP atlas; display or print the users manual; or print a table of great circle bearings.

```
SHORT-PATH PREDICTIONS              10-15-1988              Wichita TO Jakarta
Sunspot Number :   47.1    Flux : 100.0    F Hops :  5    Radiation Angle :  3 deg
                              X = FMUF           O = ECOF
```

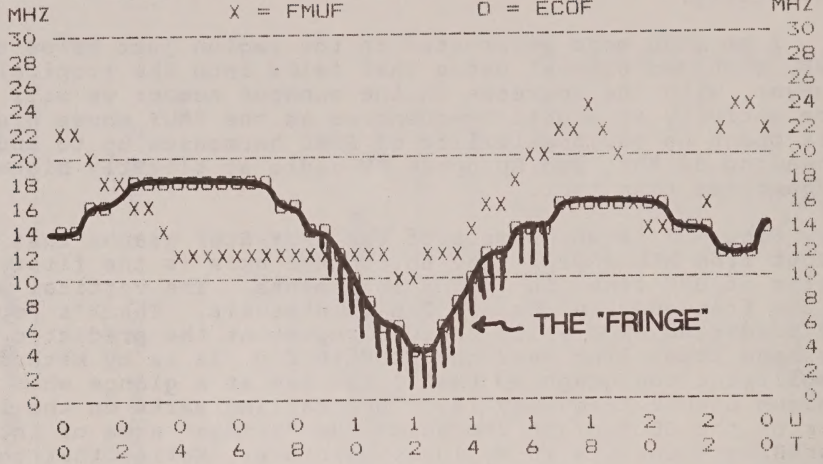


FIG 3a

```
SHORT-PATH PREDICTIONS              06-21-1988              Wichita TO Jakarta
Sunspot Number :   49.5    Flux : 102.0    F Hops :  5    Radiation Angle :  3 deg
                              X = FMUF           O = ECOF
```

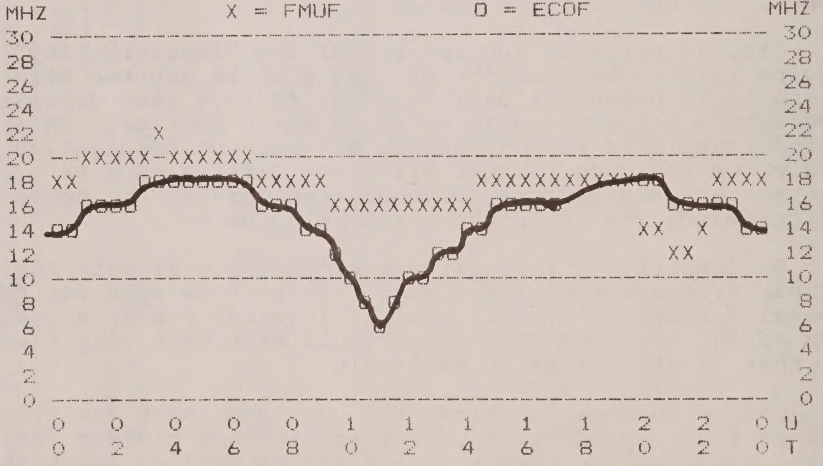


FIG 3b

FIG 3 THESE PLOTS ILLUSTRATE THE CHANGE IN CONDITIONS FOR DXING INDONESIA FROM JUNE 21 TO OCTOBER 15

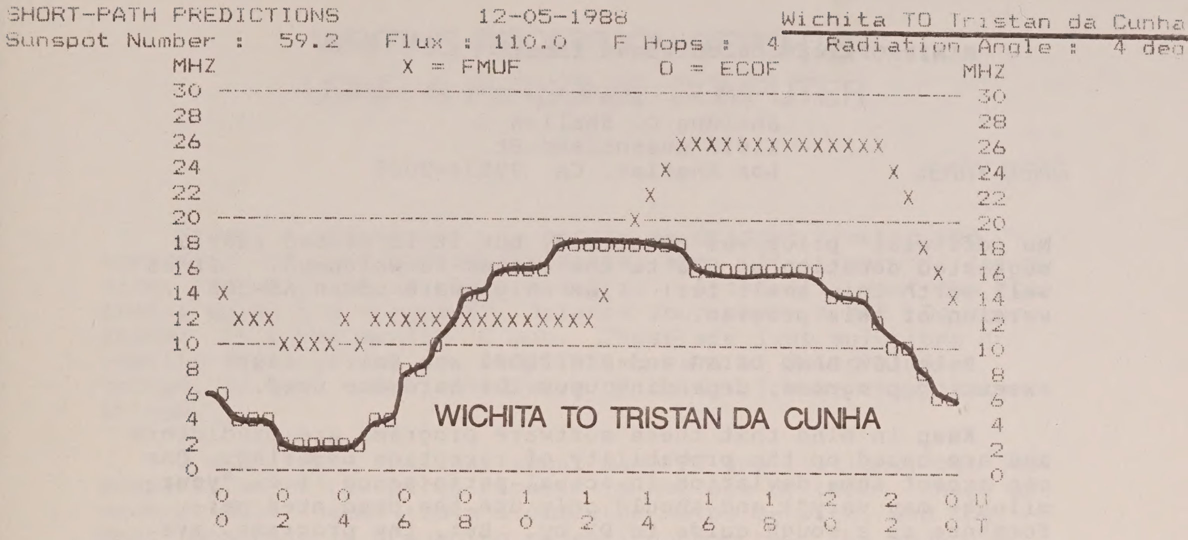


FIG 4a How likely is a logging of Tristan da Cunha's 90 mb service here in the Central US? Not at all, unless we can convince them to extend their schedule into the 0200-0400 UTC time slot!

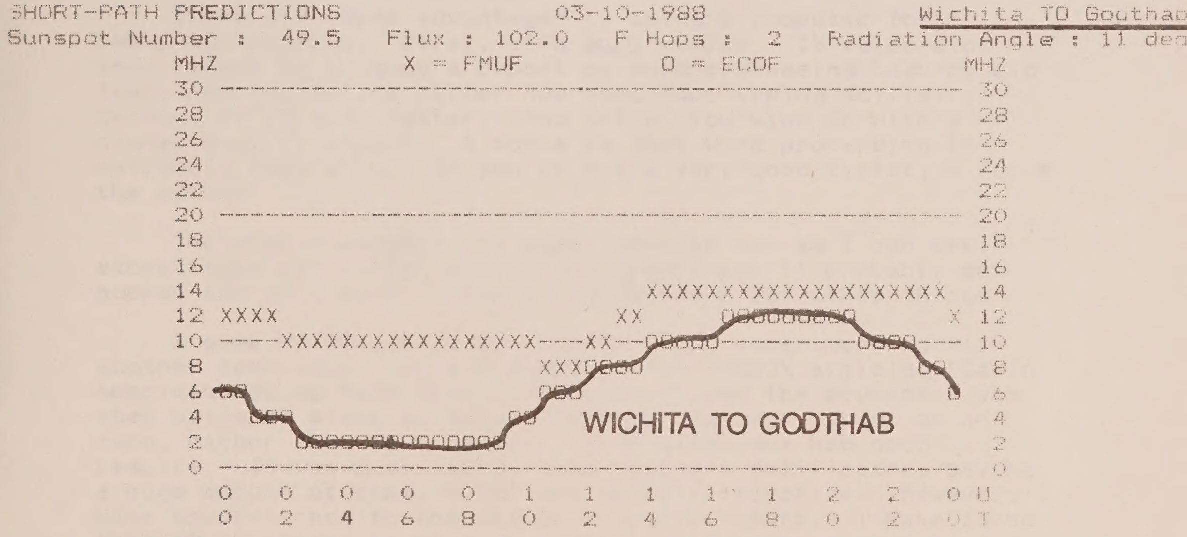


FIG 4b Greenland's service on 3999 kHz is a bit more suited for reception in the Central US, most likely from 0100-1000 UTC.

MINIPROP2 can be obtained from:

Sheldon C. Shallon
11058 Queensland St.
Los Angeles, CA 90034-3029

No 'official' price was mentioned, but it is stated that a suggested donation of $25 to the author is welcomed. It is well worth this small fee! I am only aware of an MS-DOS version of this program.

Both LOW BAND DXING and MINIPROP2 are fairly fast-executing programs, depending upon the hardware used.

Keep in mind that these software programs are predictors and are based on the probability of reception occuring. One can expect some deviation in actual performance (i.e. "your mileage may vary") and should only use the predicted performance as a rough guide to DX by. But, the programs are surprisingly accurate, as accurate as the hobbyist will require, and both programs can be extraordinary tools for the DXer.

WRITING RECEPTION REPORTS USING A PERSONAL COMPUTER

JERRY BERG

First, a confession. I had to be dragged kicking and screaming into the personal computer age. If it weren't for my kids, I'd still be using my electric. After all, what can you really do with a computer? Balance your check book? Do your taxes? File recipes??? C'mon: These are just solutions looking for problems, or complicated ways of doing simple things, or more complicated ways of doing already complicated things.

I still feel that way about many PC applications, but the preparation of reception reports is not one of them. There are several major hobby tasks a computer helps me with, and the most important is preparing reception reports. The modern PC, even with the most basic word processing software, can revolutionize this aspect of the hobby, to both your advantage and the station's. And the particular equipment you use isn't that important. I happen to use the Apple IIGS with 768K RAM, color RGB monitor (if you have kids, you have to have color), 3.5 inch and 5.25 inch disk drives, and Imagewriter II printer. Whatever your PC equipment configuration, however, it is probably suitable for preparing reception reports.

There are three advantages to using a computer for reception reports. First, it's much easier. It takes alot less effort to produce a report by word processing than by old fashioned typing, no matter how good your typing skills. Second, it is much faster. And third, you wind up with a higher quality report. A bonus is that word processing is extremely forgiving. If you're not a very good typist, a PC is the answer.

The disadvantages? No major ones as far as I can see, except that after the initial investment you'll probably get hooked and want more hardware and software for other things.

I came to PC-generated reports after experimenting with another technique. In a September 1985 FRENDX article, "Latin American QSLing Made Easy (?)", I described the process I was then using to place an entire Spanish language report on a card, rather than in a letter. That technique had good results. It was much faster than typing a full letter, saving a huge amount of time, which was my main objective. However, I have now returned to the standard letter report. I have found that it is easier to produce a three or four page report on my PC than to type two sides of a 4" x 8-1/2" card. And I can easily correct my typos on the PC as I go along. Whether or not the letter approach results in a greater reply rate than the cards is unknown. As I pointed out in my 1985 article, the card report may have an advantage insofar as it is physically distinctive when compared with the letters that stations usually receive. But from my pragmatic point of view, the speed of report preparation on the PC has led me to anbandon the cards.

The observations in this article are based on my own experience as a DXer, not a techie. I have no interest in the technical side of computing, only its ability to improve productivity. I would like to thank DXer John Bryant of Stillwater, OK who has done much work in this area and has shared his thoughts with me.

I will not address equipment issues, nor will I get into specific keyboard commands. These will vary with your setup. But I will presume a general knowledge of basic word processing (WP).

GETTING STARTED........

If I can offer one general piece of advice, it's this: "Keep it simple." It is tempting to incorporate into reception reports many of the fancy features of some WP programs. My experience is that they are more trouble than they are worth.

I utilize two WP programs. For English reports I use Appleworks (version 2.0), the standard workhorse WP program for Apple computing. For foreign language reports I use WordPerfect (version 2.0 for the Apple IIGS). WordPerfect has become pretty much the industry standard for advanced word processing, particularly for IBM compatibles. Despite the supposed "friendliness" of the Mac-like user interface in the IIGS version (pull down menus, scroll bars, dialogue boxes, etc.), it is still complicated to use and sometimes frustrating. Ditto the MS-DOS version. I went to WordPerfect because it had an important feature that Appleworks did not--an overstrike capability. But remember: Go for simplicity as long as the program will do what you want.

1. THE CONTENT OF YOUR REPORT The first step is to review the content of your report with a critical eye. How can it be improved? What can you do to it in order to increase your replies? Example: We have all heard that DXers are only interested in getting a QSL, and never tell the station anything about themselves or about the programming. One reason for this is that including such information means more typing, which takes time. Well, here is your chance to talk about yourself or the programming all you want, and without much work. The computer will write all the basics so you can concentrate on the special information that you want to convey to this particular station. Thus word processing is not just a fancier way of producing a "form" report, but a technique for producing a much more individualized report in a fraction of the time.

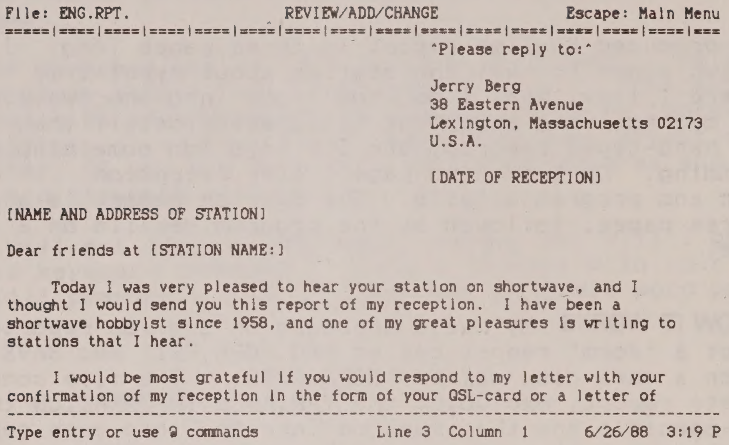
My WP-produced English report is three pages long. I use the first two pages to tell the station about myself, my family, where I live, what I do, how I got into shortwave, etc. I describe my receiving equipment (in greater detail than I would in a hand-typed report), and I always add something about the programming. On the third page I give reception information and program details. The Spanish report is a bit longer--three pages, followed by the program details on a fourth page.

2. HOW IT WORKS My basic approach on English reports is to construct a "form" report called "EG.RCPN.RPT" and SAVE it as a FILE on a data disk called "RCPN.RPTS." The file consists of a complete report, excluding the VARIABLE INFORMATION that is station-specific and that must be inserted into each report as it is prepared. At those places in the report where VARIABLE INFORMATION must be added, I include a bracketed "cue" to remind me to make the insertion. For example, where I must insert the date, station name and address, type of return postage, etc., I have inserted "[DATE]", "[NAME AND ADDRESS]", "[RETURN POSTAGE]," etc. in the body of the report to remind me of those items. When I reach that part of the report, I simply DELETE the cue and type in the necessary information. See Figures 1 and 2 for prints of the first two screens in my English report form. The VARIABLE INFORMATION items are bracketed.

I keep the number of VARIABLE INFORMATION items to a minimum. This makes them easier to spot. I have found that there need not be very many variable items in the letter portion of a reception report, even if you like to be fairly chatty.

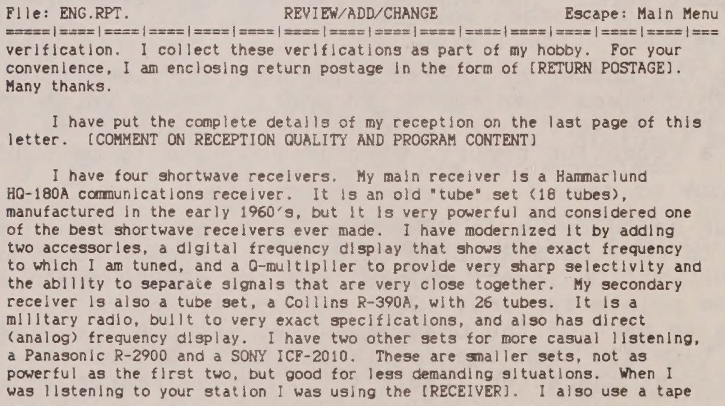
If your software has a SEARCH or FIND feature, and you don't want to rely on SCROLLING through the report to find the VARIABLE INFORMATION insert points, use the SEARCH feature to locate these points for you. Just include an appropriate insert code as part of the bracketed cue, and use the SEARCH feature to take you from one cue to another. Better yet, use the open bracket character itself ("[") as the search code.

3. RECEPTION INFORMATION AND PROGRAM DETAILS This is the most critical part of the report (at least we DXers think it is!). I prefer to keep all the information concerning time, date, fequency, reception quality and program details together on the last page of the report. This section contains most of



```
File: ENG.RPT.                   REVIEW/ADD/CHANGE              Escape: Main Menu
=====|====|====|====|====|====|====|====|====|====|====|====|====|====|====|===
                                                  ^Please reply to:^

                                                  Jerry Berg
                                                  38 Eastern Avenue
                                                  Lexington, Massachusetts 02173
                                                  U.S.A.

                                                  [DATE OF RECEPTION]

[NAME AND ADDRESS OF STATION]

Dear friends at [STATION NAME:]

     Today I was very pleased to hear your station on shortwave, and I
thought I would send you this report of my reception.  I have been a
shortwave hobbyist since 1958, and one of my great pleasures is writing to
stations that I hear.

     I would be most grateful if you would respond to my letter with your
confirmation of my reception in the form of your QSL-card or a letter of
-------------------------------------------------------------------------------
Type entry or use @ commands             Line 3  Column  1       6/26/88  3:19 P
```

Figure 1

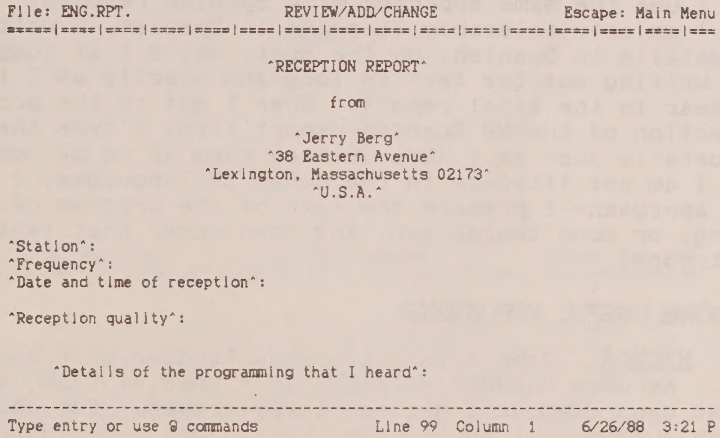


```
File: ENG.RPT.                   REVIEW/ADD/CHANGE              Escape: Main Menu
=====|====|====|====|====|====|====|====|====|====|====|====|====|====|====|===
verification.  I collect these verifications as part of my hobby.  For your
convenience, I am enclosing return postage in the form of [RETURN POSTAGE].
Many thanks.

     I have put the complete details of my reception on the last page of this
letter.  [COMMENT ON RECEPTION QUALITY AND PROGRAM CONTENT]

     I have four shortwave receivers.  My main receiver is a Hammarlund
HQ-180A communications receiver.  It is an old "tube" set (18 tubes),
manufactured in the early 1960's, but it is very powerful and considered one
of the best shortwave receivers ever made.  I have modernized it by adding
two accessories, a digital frequency display that shows the exact frequency
to which I am tuned, and a Q-multiplier to provide very sharp selectivity and
the ability to separate signals that are very close together.  My secondary
receiver is also a tube set, a Collins R-390A, with 26 tubes.  It is a
military radio, built to very exact specifications, and also has direct
(analog) frequency display.  I have two other sets for more casual listening,
a Panasonic R-2900 and a SONY ICF-2010.  These are smaller sets, not as
powerful as the first two, but good for less demanding situations.  When I
was listening to your station I was using the [RECEIVER].  I also use a tape
-------------------------------------------------------------------------------
Type entry or use @ commands             Line 42  Column  1      6/26/88  3:20 P
```

Figure 2

the report's variable information, and by keeping it together it is more convenient to insert and easier for the station to find the essentials of my reception. Additionally, it avoids placing part of this information on one page and part on another, eliminating the possibility of PAGE BREAKS where you don't want them. Placing the details at the end also serves to highlight the first two pages of the report--the letter portion--which may be the more important part of the report from the station's point of view.

Figure 3 shows the screen for the last page of the English report form, before I insert the necessary information. It repeats my name and address (in case the last page gets separated from the rest of the report), and provides space for the name of the station, frequency, date and time of reception, and reception quality. (The carets signify on screen the UNDERLINING start and stop points in Appleworks. They do not print.)



```
File: ENG.RPT.                 REVIEW/ADD/CHANGE                 Escape: Main Menu
=====|====|====|====|====|====|====|====|====|====|====|====|====|====|====|===

                               ^RECEPTION REPORT^

                                      from

                                  ^Jerry Berg^
                              ^38 Eastern Avenue^
                        ^Lexington, Massachusetts 02173^
                                   ^U.S.A.^


^Station^:
^Frequency^:
^Date and time of reception^:

^Reception quality^:


     ^Details of the programming that I heard^:

--------------------------------------------------------------------------------
Type entry or use @ commands           Line 99  Column  1     6/26/88  3:21 P
```

Figure 3

In my English reports I enter the details of reception quality in narrative form. Don't use the SINPO code. I think most stations prefer to have the quality of reception described in language rather than in code. This may take several sentences.

Figure 4 shows the last page of the Spanish report. It is a bit different from the English report in that the various Spanish reception descriptors are included in the body of the form. They are there to remind me of the proper word to use. After determining which word I want, I delete the line containing these "prompt phrases" and type in the proper word. I can then add any other sentences necessary to fully describe reception conditions.

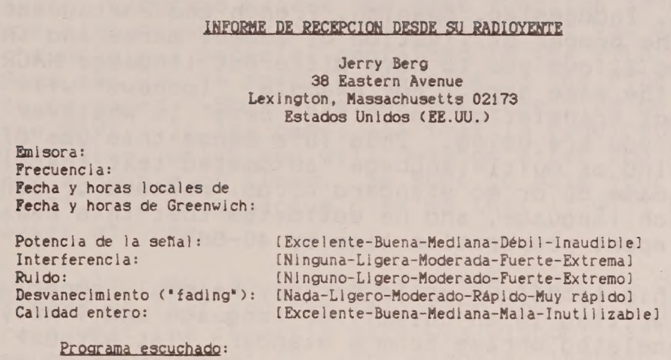
4. PROGRAM DETAILS Figure 5 shows what a "typical" set of English-language details looks like. To save space, I place the program details in a paragraph rather than a list format (I don't want the program details to run over to another page). Again, in Figure 5 the carets are UNDERLINING start and stop points (I underline the time of each program item in order to highlight it).

I like to be fairly detailed in my program descriptions. In order to indulge my expansiveness, I enter all program details manually, from the keyboard, as if I were typing a letter. I use the same approach with Spanish reports. Although I am only tolerably literate in Spanish, I write up my program details in Spanish, on the spot, while I am logging the station, writing out the text in longhand exactly as I intend it to appear in the final report. When I get to the program detail section of the WP Spanish report form, I type the program details just as I have written them up in my notes. Although I am not literate in the other DX languages, I take the same approach--I prepare the text of the program details as I am DXing, or soon thereafter, and then enter that text in my WP report form.

5. SOME USEFUL VARIATIONS

MACROS. John Bryant has experimented with another approach. He uses MACROS. A MACRO is a special FILE, saved to disk, that can remember a series of keystrokes. For example, a MACRO with a name that is represented by just a few characters could contain several words, sentences, a paragraph, several paragraphs, etc. When you type the name of the MACRO, all the characters saved under that name are inserted in your document. Many words can be "typed" instantaneously with only a few keystrokes.

John saves many phrases as MACROS. For example, "Las noticias locales" would be represented by the MACRO "locnews." When "locnews" is typed on the keyboard, "Las noticias locales" appears at the cursor on the screen. John uses other MACROS, such as "cities" ("Se mencionaron varias ciudades, que incluyen"), "id" ("Identificación de la emisora"), "maletalk" ("Discurso por un hombre"), "dec" ("diciembre," the names of the months), "femann" ("La locutora"), etc. The MACROS cover not only program details, but also things like reception



INFORME DE RECEPCION DESDE SU RADIOYENTE

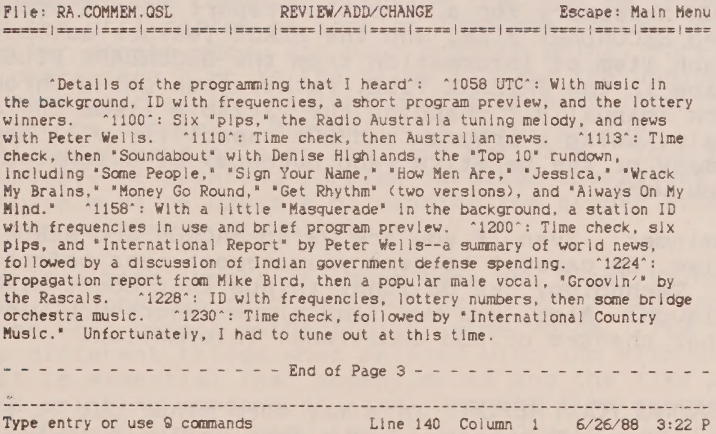
Jerry Berg
38 Eastern Avenue
Lexington, Massachusetts 02173
Estados Unidos (EE.UU.)

Emisora:
Frecuencia:
Fecha y horas locales de
Fecha y horas de Greenwich:

Potencia de la señal: [Excelente-Buena-Mediana-Débil-Inaudible]
Interferencia: [Ninguna-Ligera-Moderada-Fuerte-Extrema]
Ruido: [Ninguno-Ligero-Moderado-Fuerte-Extremo]
Desvanecimiento ("fading"): [Nada-Ligero-Moderado-Rápido-Muy rápido]
Calidad entero: [Excelente-Buena-Mediana-Mala-Inutilizable]

Programa escuchado:

Figure 4



```
File: RA.COMMEM.QSL           REVIEW/ADD/CHANGE              Escape: Main Menu
=====|====|====|====|====|====|====|====|====|====|====|====|====|====|====|===

   ^Details of the programming that I heard^:  ^1058 UTC^: With music in
the background, ID with frequencies, a short program preview, and the lottery
winners.  ^1100^: Six "pips," the Radio Australia tuning melody, and news
with Peter Wells.  ^1110^: Time check, then Australian news.  ^1113^: Time
check, then "Soundabout" with Denise Highlands, the "Top 10" rundown,
including "Some People," "Sign Your Name," "How Men Are," "Jessica," "Wrack
My Brains," "Money Go Round," "Get Rhythm" (two versions), and "Always On My
Mind."  ^1158^: With a little "Masquerade" in the background, a station ID
with frequencies in use and brief program preview.  ^1200^: Time check, six
pips, and "International Report" by Peter Wells--a summary of world news,
followed by a discussion of Indian government defense spending.  ^1224^:
Propagation report from Mike Bird, then a popular male vocal, "Groovin'" by
the Rascals.  ^1228^: ID with frequencies, lottery numbers, then some bridge
orchestra music.  ^1230^: Time check, followed by "International Country
Music."  Unfortunately, I had to tune out at this time.

- - - - - - - - - - - - - - - - - End of Page 3 - - - - - - - - - - - - - - - - -

--------------------------------------------------------------------------------
Type entry or use @ commands              Line 140  Column  1    6/26/88  3:22 P
```

Figure 5

quality ("siggood" equals "Sus señales eran fuertes," "sigbad" equals "Sus señales eran muy débiles," etc.).

John also uses WordPerfect, and he keeps a separate version (on separate disks) for each language that he regularly uses--English, Indonesian, Spanish, French and Portuguese. This allows the proper utilization of accent marks and the like. It also allows you to have different language MACROS stored under the same name. For example, "locnews" will print out the correct translation for "local news" in whatever language disk you are using. Thus in a sense this use of MACROs is a kind of multi-language "automated text translator". John has the same 50 or so standard words, phrases or sentences stored for each language, and he estimates that this capability reduces his report preparation time by 40-50%.

Use of this technique could be very helpful, especially when you are writing in an unfamiliar language and likely to rely on a translated phrase from a standard list without much elaboration. Of course, you have to remember the name of the MACRO in order to call it up.

The extent to which you will want to use MACROS will be an individualized decision, hinging largely on how much you like to rely on your computer for help in text development.

MERGE. Some WP programs have a MERGE feature which inserts certain specified text at particular places in a form. The form (in our case, the reception report) is the PRIMARY FILE, and the various items to be merged into it are placed in a SECONDARY FILE. You put all of the items of VARIABLE INFORMATION necessary for a reception report into a properly constructed SECONDARY FILE, and the MERGE feature automatically inserts each item of information from the SECONDARY FILE at its proper place in the PRIMARY FILE, rather than going through the report form "manually," changing the variable items one at a time. Again, using a program's MERGE capability will depend on just how many of the benefits (and burdens) of automated report writing you want.

A reminder: Even if you are using MACROS and MERGE capabilities, be careful to read your report over before you print it. Technology can do funny things that don't always make you laugh. Also, you may find places where you want to make further changes or add additional information.

6. SAVING YOUR REPORT This may seem minor but it is very important. Every WP operator knows instinctively to SAVE his or her work to the data disk at frequent intervals in order to avoid loss of the material in case of power failure or personal blunder. Once you have called up your form report, "EG.RCPN.RPT," make sure that as you edit it and insert the VARIABLE INFORMATION, you SAVE your work as a NEW FILE. If you save it under the original file name--"EG.RCPN.RPT"--the original text of the report form will be replaced by the edited version, and you will lose the availability of the original form for future use.

Different programs handle the SAVE function in different ways. Some have on-screen prompts that ask if you want to replace the original material contained in the FILE, and others don't. Some ask you to specify the name of the FILE as you want it to be saved. Some have options depending on how you execute the SAVE. In any case, all that is required is a little discipline, which you will develop after you've lost the form report a couple of times. Be sure to save your "EG.RCPN.RPT" file on a backup disk so that it will be there when disaster strikes.

You may also want to incorporate the report's date into it's FILE NAME so that you can tell from your FILE MANAGEMENT index screen what the report's date was without having to call up the report and look at it. For example, instead of saving your August 15, 1988 report to La Voz de los Caras as "LV.CARAS," use "CARAS.081588". Most FILE MANAGEMENT index screens show the date when you either first produced or last edited the FILE (or both), but I have found that incorporating the date into the FILE NAME itself is easier. It eliminates confusion when you have changed the text of a FILE on a date other than the date of the report. This can only be done if your program permits the use of a fairly long file name, however.

7. PRINTING One computer function that may be tricky to master is the utilization of foreign language fonts. Having your computer screen show, and your printer print, foreign language characters such as the tilde (~) and the upside down question mark used at the beginning of a Spanish interrogatory sentence can be complex. Basically it involves the compatibility of your printer and your software. Your printer must be capable of printing foreign language characters, and your software must be capable of sending the proper commands to activate the printer's capability.

This is a more important issue than you might think. Aside from the obvious fact that inclusion of tildes and accent marks gives your report authenticity, some words, like "ano," mean very different things when printed with and without a tilde. It is essential that accent marks and the like be added during the printing process or else you will find yourself searching through the printed report in order to add these marks by hand, a very tedious process.

Page numbers are added by using HEADERS or FOOTERS, text which is automatically placed at the top or bottom of a page. I omit page numbers from my reports because they take up extra lines. This in turn can sometimes cause the report to require an extra page (and extra postage), which I want to avoid.

8. FILE MANAGEMENT When you have completed a report and saved it, it is important that you be able to find it later. You should save your reception report FILES in an organized way.

I keep all English language reports (prepared on Appleworks) on a single 3.5 inch disk which can accomodate approximately 800K of memory. This is more than I am ever likely to need for outstanding English language reports (I hope).

As to reports in Spanish--the major foreign language I use--I keep them on a series of 5.25 inch double sided data disks. I do this because the WordPerfect program is on a 3.5 inch disk, and I have only one 3.5 inch drive and one 5.25 inch drive. The 5.25 inch disks hold only about 140K of information. I have four 5.25 inch disks containing Spanish reports, each disk having around nine reports on a side. Each side contains the nine or so saved reports, a copy of the Spanish form report, plus MACROS permitting me single-stroke access to accent marks and tildes.

I also make a label with a list of the reports and put it on the disk.

There are other FILE MANAGEMENT techniques that can prove helpful, especially if you have a large number of reports to manage. You could keep reports from different countries, or from different parts of the world, or in different languages, on different disks or in SUBDIRECTORIES (electronically segregated subfiles) on the same disk. SUBDIRECTORIES are particularly useful when you are using the larger volume 3.25 inch disks. But remember: "Keep it simple". Don't let the technology force you to do more than you really have to to stay organized.

9. FOLLOW•UPS Unfortunately, the computer has not eliminated the need for them. There are a couple of ways to approach follow ups.

One is to call up the original report, edit it to point out to the station that this is a follow up, save it under the report's original FILE NAME (changing the date), and print it out. With this approach, the entire report is reprinted and sent to the station as a follow up. This is the approach I generally use because the original report may never have been received by the station. The follow up may be the first time the station has actually heard from me.

For a second or third follow up, the first follow up can be retrieved and edited as necessary, and SAVED again. MACROS can be utilized effectively here for replacing a paragraph of an original report with a different paragraph that is more suitable for a follow up.

Another method is to prepare a separate introductory letter, suitable for use as a follow up, and enclose with it just the last page of the original report, the page containing the details of reception. If this approach is used, I would suggest preserving the original report on disk, and saving the follow up as a separate FILE with a "2" suffix, i.e. "R.BELGRANO.2".

Whichever method you use, it is a good idea to keep BACKUP COPIES of your reception report data disks. Accidents do happen.

It is in the area of follow ups that one drawback of computer generated reports appears: It takes time to produce follow ups. If you have 30 or 40 follow ups to send out at once, be prepared to spend time editing in new information (such as a new date, and perhaps a new reference to the number of reports you have sent before), and standing by as your printer cranks out the reports. This is particluarly troublesome if you are using NEAR LETTER QUALITY mode (as you should, see below). No matter how fast your printer, it would probably be faster to send a photocopy of your original report. Of course, the copy would not have the fresh, individualized feel of a newly printed report. The only answer to this problem is to put yourself on a schedule and send out a few follow ups at a time.

10. DELETING REPORTS This is the best part of the whole process. When the QSL arrives, go into that disk and DELETE the FILE with gusto! It's a great feeling. However, make sure you keep whatever paper records of the logging you need. Once the report is DELETED, it is gone forever.

11. SOME HINTS.......... You will have spent alot of money on your computer, and alot of time learning how to use it. Don't settle for less than a really good looking report, one that doesn't look like it came out of a computer. Here are some suggestions.

- Type in NEAR LETTER QUALITY mode. Forget speed--make it look good. (A tip from John Bryant: You can often improve the appearance of dot matrix printing by making a good quality photocopy and using it as your original.)

- Use a fresh ribbon. Don't make the gerente strain to read what you write.

- If you use continuous form paper, make sure it has clean perforations that are not readily visible after "bursting". Try before you buy.

- Pay attention to your margins, left and right, top and bottom. Your report shouldn't look like it came out of the printer by accident.

- Use accent marks and tildes and other necessary diacritical marks. This will mean that you will need an OVERSTRIKE capability, allowing the printer to reverse direction and strike over the previous character.

- Using hand fed letterhead stationery for the first page is nice, but be prepared for some minor complications. It will require setting different top margins for the first page than for subsequent pages.

- To dress up my reports, I sometimes use colored paper. It is available in continuous form style from the larger mail order computer supply houses, but it is expensive. Shop around.

Preparing reception reports as I've described is a pretty basic word processing application by today's standards. The next generation of computer produced reports will probably use the broader capabilities of so-called desktop publishing software.

Desktop publishing allows you to combine text and graphics in professional-style layouts of the type you see in books, newsletters, advertisements and brochures. All of this can be done on a PC, and printed out on your printer. It looks great. Think about the possibilities of using different fonts throughout the report (many WP programs have this feature already), logos, borders, columns and other distinctive design techniques.

The PC could be helpful in other areas of report writing as well. Though I haven't tried it, some DXers have included printed, certificate-like creations as a gift to the station, certifying that it has been heard at the DXer's distant location--a kind of reverse QSL. Such certificates could be produced utilizing some of the certificate-maker programs currently on the market. (Make sure the program gives you the necessary flexibility to design a completely unique certificate, however.)

Whether your approach is basic or fancy, the value of PC-produced reception reports is considerable, and should not be overlooked by the serious QSL seeker.

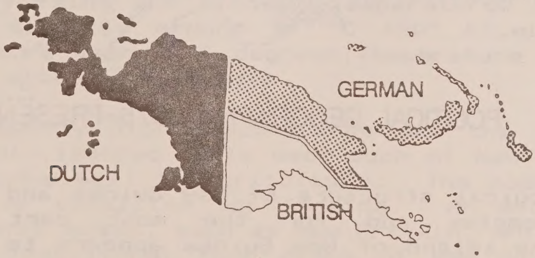
feature 1

DXING NEW GUINEA

DR. HAROLD CONES, R. CHARLES RIPPEL, WA4HHG JOHN H. BRYANT, AIA

New Guinea, the second largest island in the world, is located in the western Pacific only 100 miles due north of Australia. The eastern half of New Guinea combines with a multi-island complex to form the country of Papua New Guinea (PNG); the western half forms Irian Jaya.

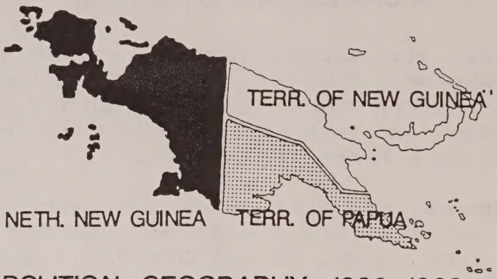
Antonio de Abrea, the Portuguese navigator, was probably the first European to see the island when he reported it in 1511. The first European to land on New Guinea was Ortiz de Retes, a Spanish explorer who landed on the northern coast of the island in 1545. In 1660, the Sultan of Ternate gave control of western New Guinea to the Dutch East India Company and in 1828, The Netherlands annexed western New Guinea. In 1884, Great Britain and The Netherlands agreed on an approximate boundary line dividing the island into roughly equal halves. German merchants began colonizing the northeastern section of the island in the late 1800s and named that portion *Kaiser Wilhelmsland.* The southeastern part of the island, *Papua*, became a British territory in 1906 under the control of the Governor-General of Australia. During World War I, Australian troops occupied *Kaiser Wilhelmsland*, and after the war, the area was mandated to Australia by the League of Nations. Japanese military occupied most of the northeastern coast early in World War II but a combined Allied military operation forced their surrender.



POLITICAL GEOGRAPHY 1900-1920

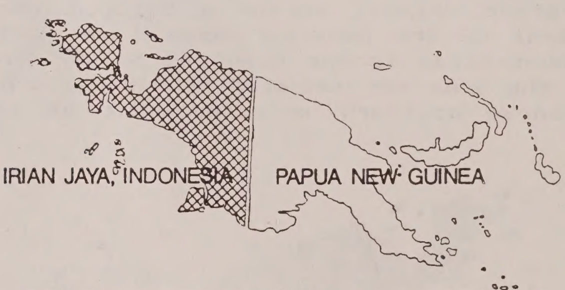
In 1950, the Republic of Indonesia was formed. Indonesia claimed the Dutch controlled portions of the island, but the Dutch refused to give up control, claiming that the people of New Guinea were not racially related to the people of Indonesia. Indonesia threatened to seize the area by force, and in 1962, Indonesia and

The Netherlands signed an agreement transferring territorial administration to the United Nations. Control was awarded to Indonesia in May, 1963, and the area was named Irian Jaya.



POLITICAL GEOGRAPHY 1920-1963

In September 1975, Australia withdrew from its United Nations sponsored guardianship of eastern New Guinea and its surrounding islands, and the new nation of Papua New Guinea joined the Commonwealth of Nations.



POLITICAL GEOGRAPHY 1975-PRESENT

The geological structure of New Guinea and its surrounding islands is complex and for the most part little known. Geologically the island of New Guinea appears to be the northern extension of the continent of Australia and the circum-Australian mountain system; however, portions of the island seem to share a geological history with the Indian subcontinent. The eastern islands, New Britain, New Ireland, Admiralty, and Bougainville, are of more recent volcanic activity and are associated with the Pacific "ring of fire", an area of intense volcanic activity caused by spreading of the earth's plates.

New Guinea is characterized by high mountain chains in the central part of the island and flattened coastal plains along its margins. Puncak Jaya (elevation 16,535'), located in Irian Jaya, is the highest mountain in the southwest Pacific and is a part of the island-long Nassau/Orange/Star/Miller mountain range system (sometimes called the "Central System"). Many of the peaks of the Central System are above the snow line.

The geologic history of New Guinea accounts for two of its principal export products, petroleum and gold, which are found in prehistoric alluvial deposits. The eastern islands are composed of less lofty volcanic mountains, some still active.

Three major rivers drain the Papua New Guinea portion of New Guinea: the Sepik River, which exits East Sepik Province near Wewak; the Strickland River, which forms a major tributary of the Fly River; and the Fly River (the longest river in the South Pacific), which exits the Western Province near Daru where it is building an extensive delta system.

There are many small and swampy coastal plains along the coast of the Central Province. The western half of New Guinea, Irian Jaya, is topographically similar to the eastern half. The northern slope of the island is drained by the Mamberamo River, the twin of the Sepik, while the southern slopes and coastal plain are drained by the Vriendschaaps, the Digul and numerous smaller rivers. Humbolt Bay, at Jayapura, is one of the finest natural harbors in the world and was the command center for General Douglas MacArthur during World War II.

New Guinea experiences the typical hot and humid climate characteristic of the tropical regions; but elevation produces a marked lowering of temperature, and the highland provinces have a much modified climate. Rainfall is heavy, typically more than 100 inches annually with some places receiving many times that amount. November through April is the time of the northwest monsoons, which bring heavy rains and winds. Temperatures in the coastal areas fluctuate slightly around 27° C (80° F),with the annual range being no more than 8 C degrees.Temperature in the higher altitudes varies with the elevation.

The continuously high temperatures and the heavy rainfall have produced badly leached soils over much of New Guinea. These soils do not respond well to agriculture. The coastal soils are often too sandy or coralline for farming. An exception is the soil of the volcanic areas, such as New Britain, which is rich and easily worked. Traditional food crops of New Guinea are sweet potatoes, taros, yams, and bananas. The major export crop is coconuts, with a growing market developing for cacao, rubber, and tea. Since pasture land for livestock is limited, pigs and poultry are the principal "livestock".

Natural vegetation of New Guinea is a mix of the eucalyptus vegetation of Australia and the Indo-Malayan vegetation. More than two-thirds of New Guinea is forested in what would be called "rain forest", which is characterized by a multistoried vegetation rich in diverse species. In areas along the coast are found swamp forests that are composed chiefly of mangroves and palms, most notably the sago palm. "Slash and burn" agriculture is widely practiced in much of New Guinea and as a result, the natural forest ecosystems have been greatly modified in some areas.

Natural animal life shows strong Australian affinities, many of the mammals being marsupials. The environment has encouraged the development of tree dwellers and the tree kangaroo is the largest indigenous mammal. Bird life is also typically Australian with some mix of Malayan species. The most noted endemic species is the bird of paradise, one of the most colorful and beautiful birds in the world.

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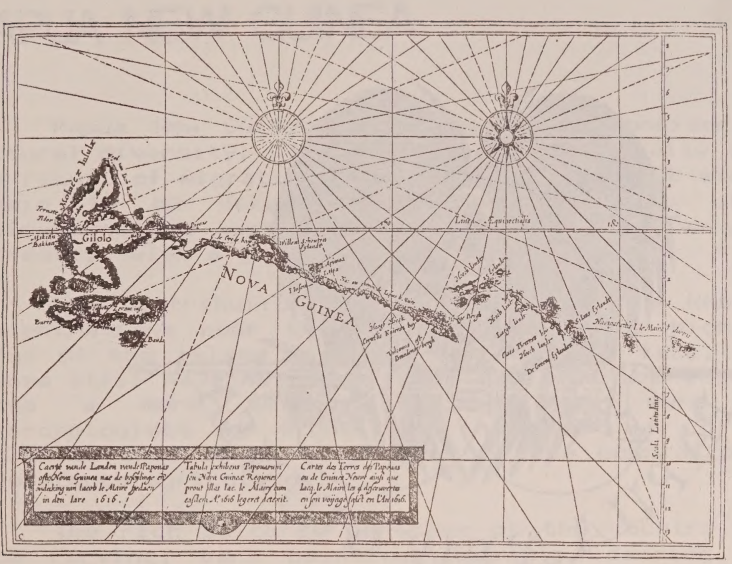
C. B. H. von Rosenberg with the Chinese coolie's hat and Sumatran sword which he wore while exploring West New Guinea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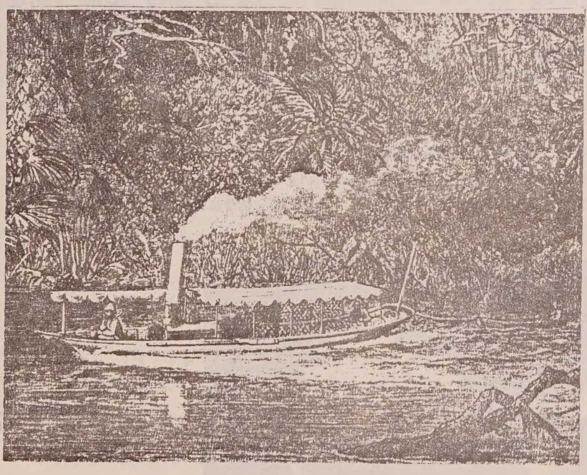
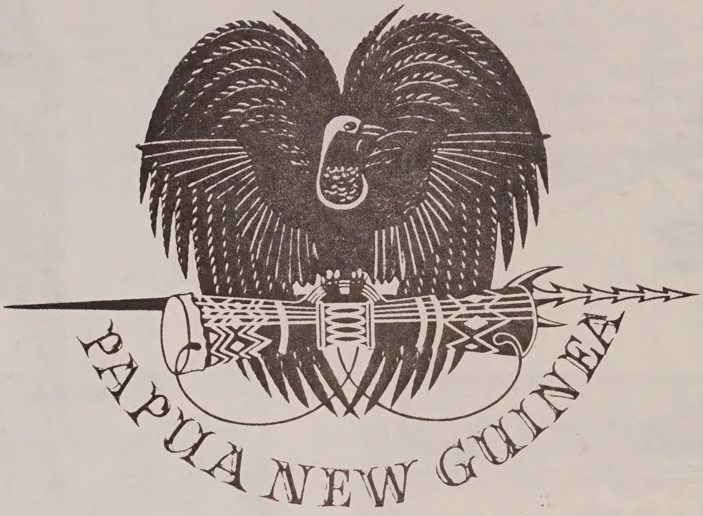
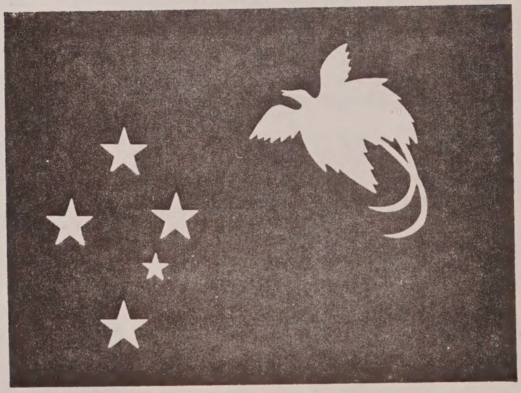



PAPUA NEW GUINEA



PAPUA NEW GUINEA

Papua New Guinea is a region of considerable racial and cultural diversity. The population is generally considered to be the result of migrations and mixture, but root stocks and sources remain to be determined. The harshness of the tropical environment has kept population levels relatively low, 3,500,000 currently, with a growth rate of 2.1%.

The distribution of the population is uneven, with major concentrations near the coasts and in the highlands. Sizable areas of the island are uninhabited. In fact, portions of New Guinea still have not been fully explored and populations in some areas a mere several decades ago were classified by anthropologists as Stone Age in their way of life. It is estimated that 85 to 90 percent of the population is engaged in subsistence agriculture.

The rich cultural heritage of the country is expressed in wood carving, bark painting, weaving, dancing, and costuming. Legends and the oral tradition still play a key role in the social structure in many areas of the country and are reenacted through song and dance. The government of Papua New Guinea has adopted a policy of preserving cultural expressions and is encouraging the revival of the older customs.

Dominant languages include English, Melanesian, and Pidgin, a simplified "trade language" blending elements of Dutch, English, and a "bit of whatever". 717 distinct native languages have been identified.

The literacy rate for the country is 32% and English is spoken by 1-2% of the population. Education is the largest single expenditure in the country's budget. Over half the population is Christian (490,000 Catholic, 320,000 Lutheran, and a smattering of other Protestant sects) with the remainder practicing native beliefs.

Although improving, transportation in Papua New Guinea is a problem. There are no railroads and paved roads are found only in the vicinity of towns. "Dirt" roads traverse most of the main island of New Guinea and are usually passable with a four-wheel drive vehicle. The Highlands Highway connects Lae with the major highlands centers of Goroka, Kundiawa, Mount Hagen, and Mendi. The lack of roads is compensated for by an impressive air service system with nearly 550 airfields tying together all the major population centers. In addition, Papua New Guinea has 5 major port facilities and a number of minor ones.

Papua New Guinea is an independent parliamentary state in the British Commonwealth with its legal system based on English common law. The government is tripartite, consisting of the executive branch (the National Executive Council), the legislature branch (the House of Assembly, with 109 members, elected to five year terms), and the judiciary branch (the Supreme Court of Papua New Guinea, plus district, local, children's, and warden's courts).

Diversity is the key to Papua New Guinea--diversity of habitats, vegetation, animal life, and people. The demands of this diversity are met by the 20 Papua New Guinea SWBC outlets, on the 120, 90, 75 and 60 meter bands. Stations originate from the main and various outer islands. The National Broadcasting Commission, from Port Moresby, has two outlets. The remaining 18 serve the unique populations of the individual provinces. A wide variety of shortwave sets is available and cost about 25% more than comparable sets sold in the U.S. Television essentially does not exist in Papua New Guinea (presently 5,000 sets); shortwave radio therefore is the major means of mass communication.

The highlands region of Papua New Guinea is reminiscent of Switzerland, with lofty mountain peaks, steep-sided valleys and broad upland valleys at altitudes of 5,000 to 10,000 feet. A major segment of the country's population lives in the highlands, yet this area, because of its ruggedness, was the last to be contacted by the colonists. The people of the remote highlands saw their first European, their first wheel, and their first steel implement in 1937! This area is served by several provinicial stations. Radio Morobe, 3220 khz, broadcasts from Lae, Papua New Guinea's second largest city. Lae, a coastal city which serves as a northern gateway to the highlands and the central mountain chain, is clean and modern and boasts of having the best golf course in Papua New Guinea. Lae is known to many because of its prominent role in World War II. After the battle of Midway, and Japan's loss of most of her carrier fleet, Lae became the center for Japanese air power in the area and remained so for nearly two years. The destruction of the strike force at Lae airstrip ended Japan's air control in the New Guinea region. For many years, a reef-wrecked Japanese vessel served as a beacon at the end of the Lae airstrip. Rounding out the broadcasters of Papua New Guinea's "Switzerland" is Radio Southern Highlands, 3275 khz, broadcasting from Mendi in the Southern Highlands Province; Radio Simbu, 3355 khz, located in Kundiawa; Radio Western Highlands, 3375 khz, from the coffee and tea plantation surrounded city of Mount Hagen; and Radio Eastern Highlands, 3395 khz, broadcasting from Goroka, the home of the highlands weavers.

The lush drainage basin of the Sepik River is served by three regional stations: Radio Enga, one of the most challenging to hear and verify of all the Papuan regionals, on 2410 khz, broadcasting from Wabag, far in the top of the highlands at the headwaters of the Sepik River; Radio West Sepik, 3205 khz, from Vanimo; and Radio East Sepik, 3335 khz, located in the famous Second World War northern coastal town of Wewak. Wewak, set on white sandy beaches where the river is building an extensive delta system, and where bomb craters may still be found, is a logical starting place to explore the rich life of the Sepik River. Throughout its length, small villages support such river-related industries as fishing and the sale of crocodile skins. Each village may also serve as home to a towering *Haus Tambarans*, or spirit house, with decorated gables and richly carved pillars. Additionally, village artists produce beautiful traditional wood carvings and masks. The Sepik River is a place where crocodiles glide quietly off the river banks as dugout canoes pass through the tall overhanging jungle grass and bamboo. A neighboring province to the southeast, Madang, although not in the Sepik drainage basin, shares in part a very similar foreboding habitat. Radio Madang broadcasts from Madang on 3260 khz.

Broadcasting on the island of New Britain from the city of Rabaul, the third largest city in Papua New Guinea, is Radio East New Britain (3385 khz). The circular harbor at Rabaul was created when an ancient volcano subsided and the Solomon Sea filled the void. The harbor is one of the finest harbors in the world and served as the main center of Japanese fleet operations, south of the main islands, in World War II. Rabaul harbor was used by the Japanese as a supply base for the invasion of the Solomons Islands and was to be the main supply base for the invasion of Australia. The harbor is surrounded by still active volcanos and is considered by many to be the most beautiful in the world. Rabaul was seriously damaged by volcanic eruptions in 1878 and 1937, and was hardly restored when the Japanese occupied the area in 1942. East New Britain Province shares the island of New Britain with West New Britain Province. The 2 kw outlet, Radio West New Britain, broadcasting from Kimbe on 3235 khz, is a frequently heard Papuan.

Central Province, with its jungled interior and lush coast, is served by the main National Broadcasting Commission station at Port Moresby. The Coral Sea forms a dramatic backdrop to the city. Port Moresby is the largest and most modern of Papua New Guinea cities and is the center of governmental operations for the country. Sidewalk vendors sell nuts, beads, shells and wood carvings. The city is a mix of architecture, the old blending with the new as the city spreads along the coast. Port Moresby has two distinct seasons, a wet season from December to March, and a dry season from May to November. NBC-Port Moresby, operating on 4890 khz in English, is the most reliable performer of the Papuans and often provides arm chair copy to most of North America year-round. The listed 3925 khz frequency for NBC-Port Moresby has been inactive for some time. Adjacent Northern Province is served by rarely heard Radio Northern from Popondetta on 3345 khz. Further up the lush coast from Central Province and to the west, is Gulf Province, with Radio Gulf, 3245 khz, broadcasting from Kerema, and Western Province, with Radio Western, on 3305 khz, from Daru. Daru, with its low tide mud flats and rock pools, is a major tourist mecca. Sailing canoes, some up to 15 meters long with three sails and two outriggers, come to Daru daily from outlying villages to trade. Their sails are characterized by bright colors and patchwork composition, often constructed of anything that will catch wind, including discarded rice bags. Daru also has a fleet of canoe "houseboats" with sago palm roofs and is an active trade center for turtles and dudongs.

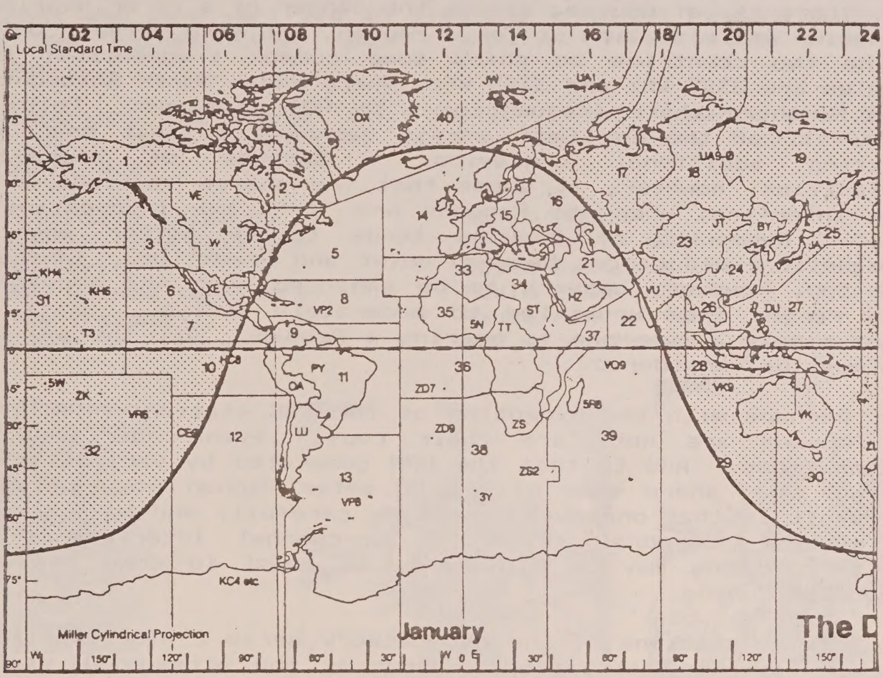
Alotau, the provincial center for Milne Bay Province, is the home of Radio Milne Bay (3360 khz). The coastal area in the region of Alotau is covered by thick brush and palm trees while elsewhere the coast is a mass of sago palms and mangroves. Milne Bay Province, extending well into the Solomons Sea and composed of 650 sandy beach islands and atolls, is one of the most beautiful in Papua New Guinea. The Milne Bay islands which make up the Trobriand Islands, are referred to as the "Islands of Love." The Trobriand people are well known for their art style, Massim Art, which employs highly decorated intricate designs in carvings of ebony and other native timber.

The remaining regional stations are located on smaller volcanic islands adjacent to the main island of New Guinea. To the northeast of Milne Bay is the eastern-most island of Papua New Guinea, Bougainville Island, which forms North Solomons Province. Radio North Solomons on 3325 khz broadcasts from the town of Kieta on the northern coast. The very rugged terrain of Bougainville is a result of its volcanic origin. New Ireland Province, just to the northwest of North Solomons, is represented on shortwave by Radio New Ireland on, 3905 khz, which broadcasts from Kavieng. Kavieng is often described in tourist literature as a "typically pretty South Seas town." Radio New Ireland often packs an easily heard signal into North America, however, its placement in the 75 meter Ham band often makes its reception difficult. The northern-most island group of Papua New Guinea, the Admiralty Islands, form Manus Province. Radio Manus, broadcasts on 3315 khz from the beautiful town of Lorengau.

For listeners on the East Coast of the United States, the Papuans can be challenging catches. All outlets are either 2 KW or 10 KW, and experience has shown that the 10 KW outlets are only marginally better copy than those running 2 KW. Within the next year, however, reception of many Papuans will improve as most of the 2 KW stations are upgraded, in stages, with 10 KW NEC transmitters received as part of an aid agreement with Japan (the addition of new transmitters may allow resumption of service on the 49, 31, and 25 meter bands, which was suspended several years ago). During the last year, the most reliable reception windows seem to occur 3-4 days on either side of the 28-day solar flux peaks, with best reception taking place from late September till late March. During spring and summer months, the noise generated by thunderstorms in our hemisphere, combined with the negative complexities associated with trans-equitorial propagation during that time of the year, renders a reliable logging of the Papuans difficult, if not impossible.

A look at world wide Sunrise/Sunset patterns with the DX Edge for January, for instance, reveals that most of Central and

South America have been in daylight for some time as at East Coast Sunrise. At 1200 UTC, the sun is just coming up over the southern portion of Mexico and Brazil has been in daylight for nearly 4 hours. This situation would provide reduction, if not total elimination, of QRM from what few Latin stations might still be broadcasting during prime Papuan times.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Although the majority of the National and Provincial stations sign on at 0700, and broadcast on the 90 meter band, East Coast DXers are unable to hear them until just before local sunrise due to propagational enhancements. In the winter months, the Papuans typically appear just a few minutes before local sunrise and offer reasonable reception possibilities for approximately an hour. On the East Coast of the United States reception is possible until about 1300 UTC. On occasion, several of the more reliable outlets are heard right up until 1400, which is when the majority of the Papuan stations sign off. Often, the 90 meter outlets seem to "rise out of the noise" over a matter of a few minutes, or sometimes a few seconds. The time to hear the rare outlets is more a function of local sunrise rather than UTC; listeners more westerly must adjust their times accordingly.

The proven technique of using a consistent station as a propagation "beacon" works well for the Papuans. As the majority of the outlets are on the 90 meter band, Radio East Sepik (3335 khz), the 10 KW station broadcasting from Wewak, on the Northern Coast of East Sepik Province, is an excellent beacon for East Coast listeners. Since the 60, 75 and 120 meter bands are currently occupied by only one Papuan outlet, they serve as beacons themselves. The exception is Radio Enga. Good reception from the 120 meter Australians justifies extra vigilance on 2410 khz. There is, of course, always the danger of a DX'er hearing an Indonesian and mistaking it for a Papuan, and vice versa. Outlets in the two countries do share some common frequencies; prime examples are 3325 khz and 3345 khz, where Radio North Solomons and Radio Northern share frequencies with RRI stations. China and nearly all of the Far East are in darkness at that hour also, injecting additional confusion. Because of propagation pecularities, however, it seems that the shared stations do not often interfere; when the Papuans are "in", the Indonesians are "out." Reception of Papuans tends to be better when the geomagnetic field ranges between quiet and unsettled. Indonesian reception, however, appears to be enhanced when the geomagnetic field ranges from unsettled to moderately active. Still, one cannot simply assume one is hearing a Papuan. All the available data must be considered.

Perhaps with the exception of the NBC station on 4890 khz, the Papuans are not "arm chair copy," even under the best of conditions. Add to that the QRM generated by various utility stations that share some of the 90 meter Papuan frequencies and the result is that one must tune very carefully and make generous use of the "cerebral filter." Co-channel interference from utility stations may be minimized, at least in some cases, by using ECSS tuning.

The 20 stations of the NBC network serve a widely-scattered and very diverse population. Most of the provincial stations broadcast in one or more of the local, or provincial, dialects as well as Pidgin (pronounced "pisin"), and sometimes, English. Most of the programming is local music, usually reported as "island music," with announcements every one or two songs. The majority of the "island music" sounds very much like African "highlife music", however, it is not unusual to encounter Country and Western-style music. At times, news and commentaries run as long as 30 minutes, usually from the top of the hour. The PNG regionals do not always time their station ID's and breaks on the hour and half hour. If an ID is not heard at exactly the top of the hour, one usually will be forthcoming. Some stations run a few minutes slow, some a few minutes fast. Although noted at times, English language broadcasts do not seem to be the norm for any of the regional stations, however, time checks and station identifications in Pidgin may be encountered. The NBC station on 4890 khz (perhaps the easiest of the Papuans to hear), however, regularly uses English.

Unlike many other "rare" stations, the majority of the Papuans seem to verify promptly. QSL's have been received in as little as 20 days using the station addresses in the WRTH. Better

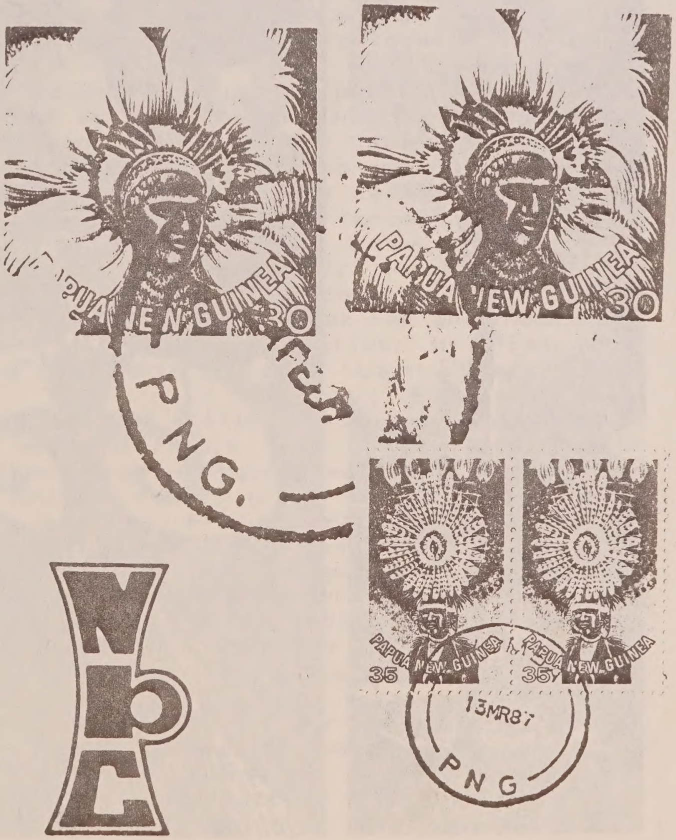
QSL results are often realized from the Papuans by sending mint stamps and a self-addressed business size airmail envelope. Mail is not delivered by carriers in Papua New Guinea. It must be deposited and picked up at area post offices.

NASWA has recognized the challenge of DXing the Papuans and offers two awards. The Papua New Guinea DX'er award is available for those who have verified 10 stations from the region; a Master Papua New Guinea DX'er award requires verification from 15 stations.

Stations in Papua New Guinea count toward six NASWA countries. These countries, and the more easily heard station from each, are:

Admiralty Islands-	Radio Manus
Bouganville Islands-	Radio North Solomans
New Britain-	Radio East New Britain
New Guinea Territory-	Radio East Sepik
New Ireland-	Radio New Ireland
Papua Territory-	NBC, Port Moresby

PAPUA NEW GUINEA 1
PAPUA NEW GUINEA 1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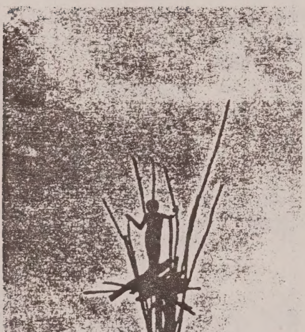
IRIAN JAYA

the warriors



IRIAN JAYA

Like the eastern half of New Guinea, Irian Jaya is a land of radical contrasts. The central range contains many mountains rising above 15,000 feet and glaciers exist practically on the equator. However, directly south of the great central range lies some of the least inviting, most impenetrable swampy coastal plain on the planet. Triple canopy jungle, 20' crocodiles and swarms of mosquitoes appear to be the norm in this inhospitable area.

The population of Irian Jaya is even more sparse than that of Papua New Guinea, with only slightly more than 1,000,000 people occupying the western half of the island. These people, predominantly Melanesian and Papuan with some Negrito Micronesian and Polynesian ethnic groups, are scattered rather evenly across the northern and southern plains. Population centers are in the coastal towns, such as Jayapura, the capitol, as well as Manokwari and Sorong. Smaller towns, with populations of 10,000 or less, exist at Biak, Fak Fak, Serui and Merauke. Only one town exists in the interior of Irian Jaya: Wamena, located in a large beautiful high mountain valley in the great Central range. Irian Jaya is the most easterly of the Indonesian Provinces.

No shortwave broadcasting was known to exist in Western New Guinea prior to the end of WW II. As the Allies withdrew, the Dutch colonial forces resumed control of the Island, eventually establishing three SWBC stations: Biak, Sorong and Hollandia (now Jayapura). These stations formed the network *Radio Omerore Nieuw Guinea.* When political pressure eventually forced the Dutch to withdraw from Netherlands New Guinea, these three stations were turned over to the United Nations, and, finally, to the Indonesians and RRI. Since 1963, the Indonesians have added stations at Merauke, Wamena, Nabire, Serui, Fak Fak and Manokwari. There are nine *Kabupaten* (equivalent to counties) in Irian Jaya; the nine RRI stations are located in the nine "county seats."

Receiving the Irian Jaya RRI stations from anywhere in North America is a good bit more difficult than DXing their sister stations across the 141° meridian in Papua New Guinea. There are three main reasons for this: first, great circle distances to Irian Jaya are just a bit greater. From Central North America, it is about 8,100 miles to central Papua New Guniea and about 8,500 miles to central Irian Jaya. Secondly, signals from Indonesian stations must pass somewhat closer to the auroral zone than those from Papua New Guinea in reaching the U.S. Thirdly, sunset times in western Irian Jaya are almost 1 hour 40 minutes later than those in eastern Papua New Guinea. This is particularly important to East Coast DX'ers, for the later Irian Jaya sunset significantly reduces the "DXing window" prior to dawn fade out of the Tropical Bands in North America. Additionally, listed transmitter powers for the RRI stations are almost all 1 kw or less--therefore, less than half the wattage of their Papua New

Guinea sister stations.

For those just starting out on the hunt for Irian Jayans, the two easiest targets will likely be those on the major islands off the north coast: Serui and Biak. The town of Biak is located on a crowded island of the same name 125 miles (200 km) off Irian Jaya's north coast. It was a scene of intense fighting during WW II. Today, Biak is prospering as a supply center for the off-shore oil industry and as a base for the international tuna fishing industry. RRI Biak is a relatively easy catch, if it can be found. In recent years, it has jumped regularly between 5500.5 khz and 5451 khz. In spring 1988, it was reported on 5882.9 khz and 7212 khz. Serui is also an island oil town, though smaller and sleepier than Biak. Little RRI Serui, at 500 watts, often puts in the most reliable signal from Irian Jaya. Rock-steady on 4607.3 khz, it serves as a "beacon station" for DXing other stations in the area.

Oil was first discovered in New Guinea near the far western tip of the island, at Sorong, almost 50 years ago by the Dutch. Today, the port of Sorong has boomed from a settlement of just a few thousand two decades ago, to become Irian Jaya's second largest city of over 40,000. RRI Sorong, listed at 10 kw and probably the most powerful operational transmitter in Irian Jaya, used to be the easiest to hear, operating on 4874.8 khz. Unfortunately, the advent of the Voice of Jinling, from Nanjing, Peoples Republic of China, on 4875 khz, has made Sorong much harder to hear, although it has been heard prior to Jinling's 1145 sign on. RRI Sorong was also reported in North America in Spring, 1988, with an 0800 UTC sign on on 9740 khz.

The area around Manokwari, a town nestled on top of the "Bird's Head" Peninsula, has for several centuries been settled by a mixture of Irianese, Chinese, Filipinos, Buginese and Moluccans. Today, it is predominantly Christian. Manokwari, which is also an oil boom town, is the site of a growing sawmill industry. RRI Manokwari on 3986.2 khz has been a very reliable performer during the 1988 season, at least prior to the sign on of the 50 kw Korean on 3985 khz at 1400 UTC.

A very reliable, although weak, performer is RRI Fak Fak, some DX'ers favorite station ID. RRI Fak Fak, located in the sleepy coastal town of the same name, is most commonly heard on 4790(V) khz, although in Spring, 1988, the 3644.8 khz (0.25 kw) transmitter was heard at its 1400 UTC sign off. Care in IDing Fak Fak is necessary since 4790 khz is shared with the often reported Azad Kashmir Radio.

Another quite reliable Irian outlet is the 500 watt RRI Wamena, found in recent months on 4871 khz, although it also lurks around 5044 khz, its alternate frequency. Careful listening at RRI Wamena's 1215 UTC sign off will provide East Coast listeners with one of the few opportunities to hear *Love Ambon.* Wamena, an administrative and missionary center under both the Dutch and the

Indonesians, is located in the storied "Shangri-la", a mile-high valley of the Baliem River, high in the central range. It is said that the immediate area around the town of Wamena is the only reasonably flat area in the entire central range. The 45 km long Baliem Valley is considered one of the true beauty spots on earth. It is, however, inhabited and controlled by 100,000 fierce Stone Age Dani people and is known in New Guinea as "Cannibal Valley." The Dani are being brought into the modern world rather carefully and there has been no violence in recent years. The most recent incident was on Christmas Day, 1974 when four families of Dutch missionaries were killed and eaten.

The provincial capital city of Jayapura has a population of approximately 50,000 and was known under the Dutch as *Hollandia*. The hills around Jayapura form a dramatic amphitheater, with excellent views over the town to the sea. General MacArthur's Pacific Headquarters were located here during 1944 and 1945. Today the old Base G is known as *Bestiji*, and MacArthur's former command post forms part of a fish farm.

Although RRI Jayapura is the base station for RRI Network 5 (Irian Jaya and the Moluccas), it is quite difficult to hear. When present, the signal is often extraordinarily weak and undermodulated. It may be that the original Dutch transmitters installed soon after WW II are still in use and nearly worn out. Until recently, most DX'ers searching for Jayapura reported hearing the 9611.7 khz outlet, however, starting in 1986, 5044(V) khz seemed much more reliable and a very nice catch. Indications are that the 6070 khz outlet is once again active.

Probably the second most difficult catch among the Irian Jaya RRI's is RRI Nabire, located in a sleepy northern coastal village of the same name. Nabire is reputed to operate a 1 Kw transmitter, however, either their antenna/transmitter is badly flawed or the topography blocks almost all radiation to the north (unlikely at this coastal site). RRI Nabire is considered an extremely rare DX catch even on the West Coast. An Ontario DX'er heard Nabire on 5055.4 khz during the Spring Equinoctal period in 1988, so East Coast reception appears possible, though extremely difficult.

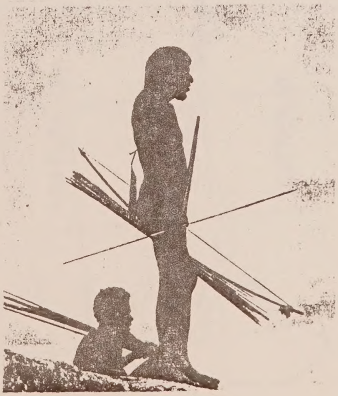
Finally, there is RRI Merauke. Merauke is a coastal village and serves as the administrative center for the south central coast of Irian Jaya. This coast, facing the highly dangerous Arafura Sea, is considered one of the most dangerous on earth. It is truly little more than a large triple-canopied swamp, frequented by giant crocodiles and all sorts of other nasty fauna. Michael Rockefeller (of "Michael Rowed the Boat Ashore" fame) died exploring this coast in 1963. Anthropologists and police officials say that if any truly head-hunting tribes remain on earth, they will be found in the area immediately inland from the Merauke Coast. Merauke is also reputed to have a 1 kw transmitter. Unfortunately, it operates on 3905 KHz, co-channel with Papua New Guinea's Radio New Ireland, a very solid performer for running only 2 kw. It is only poetic justice that the Chief Engineer (*Kepala Seksi Teknik*) of RRI Merauke is one of the DX community's best friends and a meticulous verifier of correct reception reports. His name is Eho Budi Sutoyo; he opened RRI Merauke in 1964, moving over from RRI Madiun in Eastern Java. In a recent letter, Mr. Sutoyo stated that he had received several letters from Europe over the years, but only two correct reports from the USA. Probably the only chance to hear RRI Merauke is to catch Radio New Ireland with transmitter trouble during an Equinoctal period. For many, RRI Merauke ranks with Mauritius and Bhutan as being almost, but not quite, impossible.

Programming on the Irian Jaya RRI stations consists mostly of locally generated programs--in the late evening (1200 to 1400 UTC) this usually means music with a local DJ. The music can vary from distinctly Islamic sounds to indigenous music, which is very similar to the string band music of Papua New Guinea.

Most DX'ers familiar with the Indonesian SWBC scene use the national network news relays from Jakarta and the distinct Interval Signal preceding the news as an important DX tool. The interval signal is known as Song of the Coconut Islands (in Bahasa Indonesian: *Rayuan Kelapa Palau*) and is played on the network for the two minutes before the hour. At 1200 UTC, Programa Nasional has national news and commentary (*Warta berita sentral + laporan + komentar*). At 1300 UTC, Jakarta runs economic and development news (*Warta Berita Ekonomi + Industri*). At 1400 UTC, Jakarta offers feature stories from the ASEAN countries, though most stations do not carry it, and at 1500 UTC, Programa Nasional offers *Anaka Berita*--human interest news. ONE MAJOR CAUTION: several of the Irian Jaya stations DO NOT always relay even the 1200 UTC main news from Jakarta all of the time. This is the only area of Indonesia where this is known to be true. For instance, in 1988, Wamena is running a brief local newscast at 1200 UTC and then closing down by 1210. Even the key station, RRI Jayapura, is known to be a somewhat irregular relayer of news from Jakarta.

The island of New Guinea and its surrounding islands are certainly one of the most exotic areas of the world. The island has a superb group of shortwave stations and most are good verifiers. These stations range in reception difficulty from the PNG national outlet on 4890 khz, which is audible from any location in North America on most mornings, to RRI Merauke on 3905 khz, which is nearly impossible to hear, even from the West Coast. All, however, present a reasonable degree of challenge. Good luck and good DXing!

Authors' Note: We have chosen to illustrate this article with pictures of the citizens of the island of New Guinea in their traditional attire. Some of the photographs are modern and some are from the 19th Century. Of course, the peoples and notions of this part of the planet are rapidly emerging and developing, gaining many of the attributes of modern society. As this process continues, the authors hope that the people of this region can preserve the positive aspects of their unique historical heritage.



Further Reading

IRIAN JAYA:

"Insight Guide to Indonesia" editor: Eric Oey carried in North America by Prentice-Hall.
This is the best cultural guide to Indonesia currently available. It has a good section on Irian Jaya.

"Shortwave Listening with the Experts" edited by Gerry L. Dexter.
This justly famous blockbuster has a superb section on Indonesian SWBC by senior DX'er Bill Sparks of California.

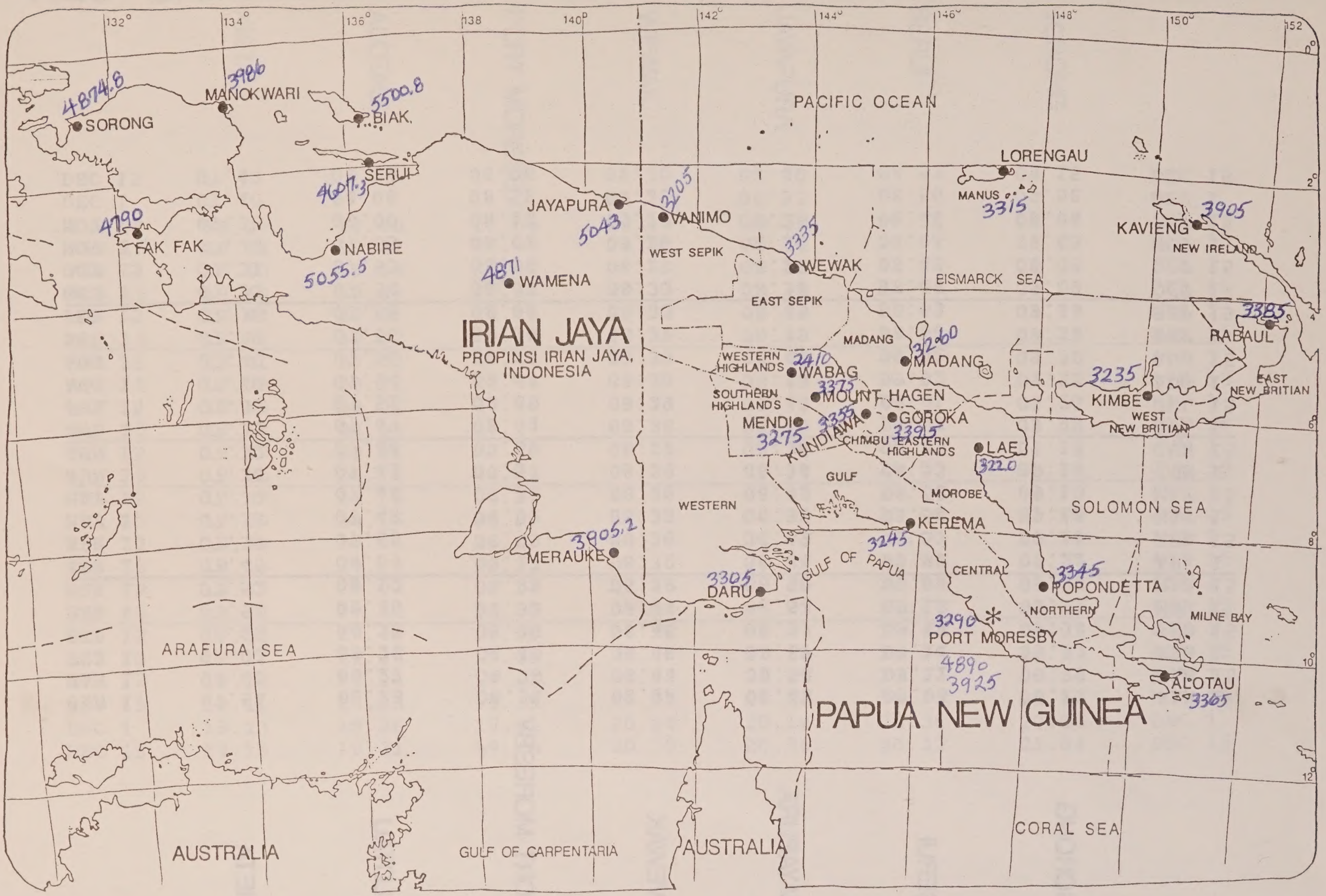
"Gardens of War" by Gardner and Heider; Random House, 1968.
Absolutely wonderful anthropological study of the Dani People near Wamena. A great read with super pictures.

"Headhunters of Papua" by Tony Saulnier; pub: Crown of New York, 1961.
An earlier and equally good study of both coastal and mountain people in Irian Jaya.

"I come From the Stone Age" by Heinrich Harrer; pub: E.P. Dutton, 1965.
Wonderful diary with photos of German anthropological and mountain climbing expedition of 1963.

NEW GUINEA:

"New Guinea: The Last Unknown" by Gavin Souter.
A very good general history of New Guinea Island with some bias toward the eastern half of the island.


132°
134°
136°
138
140°
142°
144°
146°
148°
150°
152
2°
4
6
8°
10°
12°
PACIFIC OCEAN
4874.8
SORONG
3986
MANOKWARI
5500.8
BIAK
4607.3
SERUI
4790
FAK FAK
NABIRE
5055.5
4871
WAMENA
JAYAPURA
5043
3205
VANIMO
WEST SEPIK
3335
WEWAK
EAST SEPIK
LORENGAU
MANUS
3315
BISMARCK SEA
KAVIENG
3905
NEW IRELAND
3385
RABAUL
EAST NEW BRITIAN
3235
KIMBE
WEST NEW BRITIAN
IRIAN JAYA
PROPINSI IRIAN JAYA, INDONESIA
MADANG
3260
MADANG
WESTERN HIGHLANDS
2410
WABAG
3375
MOUNT HAGEN
SOUTHERN HIGHLANDS
MENDI
3275
3355
KUNDIAWA
CHIMBU
GOROKA
3395
EASTERN HIGHLANDS
LAE
3220
GULF
MOROBE
WESTERN
KEREMA
3245
SOLOMON SEA
3905.2
MERAUKE
3305
DARU
GULF OF PAPUA
CENTRAL
3345
POPONDETTA
NORTHERN
MILNE BAY
3290
PORT MORESBY
4890
3925
ALOTAU
3365
ARAFURA SEA
PAPUA NEW GUINEA
CORAL SEA
AUSTRALIA
GULF OF CARPENTARIA
AUSTRALIA

3325 - Kieta
N. Solomons

SWBC TRANSMITTER SITES IN PAPUA NEW GUINEA AND IRIAN JAYA

PLEASE NOTE: FOR CARTOGRAPHIC CONVENIENCE, THE NORTH SOLOMONS PROVINCE OF PAPUA NEW GUINEA WAS NOT SHOWN. NORTH SOLOMONS PROVINCE PRIMARILY CONSISTS OF BOUGAINVILLE ISLAND. THE PROVENCIAL CAPITOL AND SWBC SITE IS AT KIETA ON BOUGAINVILLE.

BRYANT NCDXS/NASWA 1988.

UTC SUNSET TIMES IN PAPUA NEW GUINEA AND IRIAN JAYA

	KIETA	ALOTAU	PORT MORESBY	WEWAK	JAYAPURA	SERUI	SORONG	
JAN 1	07.56	08.23	08.35	08.38	08.48	09.05	09.23	JAN 1
JAN 15	08.01	08.27	08.39	08.44	08.54	09.11	09.29	JAN 15
FEB 1	08.03	08.28	08.40	08.47	08.57	09.14	09.33	FEB 1
FEB 15	08.02	08.25	08.38	08.46	08.57	09.14	09.33	FEB 15
MAR 1	07.58	08.20	08.33	08.44	08.54	09.12	09.32	MAR 1
MAR 15	07.52	08.12	08.25	08.38	08.50	09.08	09.28	MAR 15
APR 1	07.45	08.03	08.17	08.32	08.44	09.02	09.22	APR 1
APR 15	07.38	07.55	08.09	08.26	08.39	08.57	09.18	APR 15
MAY 1	07.33	07.48	08.02	08.22	08.35	08.54	09.15	MAY 1
MAY 15	07.30	07.44	07.58	08.20	08.33	08.52	09.13	MAY 15
JUN 1	07.30	07.43	07.57	08.20	08.34	08.53	09.14	JUN 1
JUN 15	07.32	07.44	07.59	08.23	08.36	08.55	09.17	JUN 15
JUL 1	07.35	07.47	08.02	08.26	08.40	08.58	09.20	JUL 1
JUL 15	07.38	07.51	08.05	08.29	08.42	09.01	09.23	JUL 15
AUG 1	07.40	07.54	08.08	08.30	08.43	09.02	09.23	AUG 1
AUG 15	07.40	07.56	08.10	08.30	08.42	09.01	09.22	AUG 15
SEP 1	07.39	07.56	08.09	08.27	08.39	08.58	09.18	SEP 1
SEP 15	07.36	07.55	08.08	08.23	08.35	08.53	09.13	SEP 15
OCT 1	07.33	07.54	08.07	08.20	08.31	08.49	09.09	OCT 1
OCT 15	07.31	07.53	08.06	08.17	08.28	08.45	09.05	OCT 15
NOV 1	07.32	07.55	08.08	08.16	08.26	08.44	09.03	NOV 1
NOV 15	07.35	08.00	08.12	08.18	08.28	08.46	09.04	NOV 15
DEC 1	07.40	08.06	08.18	08.23	08.33	08.50	09.08	DEC 1
DEC 15	07.47	08.14	08.26	08.30	08.40	08.57	09.15	DEC 15

	KIETA	ALOTAU	PORT MORESBY	WEWAK	JAYAPURA	SERUI	SORONG	
JAN 1	19.27	19.40	19.54	20.18	20.32	20.51	21.13	JAN 1
JAN 15	19.34	19.47	20.02	20.25	20.38	20.57	21.19	JAN 15
FEB 1	19.40	19.55	20.09	20.30	20.43	21.02	21.23	FEB 1
FEB 15	19.43	19.59	20.13	20.33	20.45	21.04	21.25	FEB 15
MAR 1	19.44	20.01	20.15	20.32	20.45	21.03	21.24	MAR 1
MAR 15	19.43	20.02	20.15	20.30	20.42	21.00	21.20	MAR 15
APR 1	19.41	20.02	20.15	20.27	20.39	20.56	21.16	APR 1
APR 15	19.39	20.02	20.14	20.25	20.35	20.53	21.12	APR 15
MAY 1	19.39	20.02	20.15	20.23	20.33	20.51	21.10	MAY 1
MAY 15	19.39	20.05	20.17	20.23	20.33	20.50	21.09	MAY 15
JUN 1	19.42	20.08	20.20	20.25	20.35	20.52	21.10	JUN 1
JUN 15	19.45	20.12	20.24	20.28	20.38	20.55	21.13	JUN 15
JUL 1	19.49	20.15	20.27	20.31	20.41	20.58	21.16	JUL 1
JUL 15	19.50	20.16	20.29	20.33	20.43	21.00	21.19	JUL 15
AUG 1	19.49	20.14	20.27	20.33	20.43	21.00	21.19	AUG 1
AUG 15	19.46	20.10	20.22	20.30	20.40	20.58	21.17	AUG 15
SEP 1	19.39	20.02	20.14	20.25	20.35	20.53	21.13	SEP 1
SEP 15	19.32	19.52	20.05	20.18	20.29	20.47	21.07	SEP 15
OCT 1	19.24	19.43	19.56	20.11	20.23	20.41	21.01	OCT 1
OCT 15	19.17	19.35	19.48	20.06	20.18	20.36	20.57	OCT 15
NOV 1	19.13	19.28	19.42	20.02	20.15	20.33	20.54	NOV 1
NOV 15	19.11	19.25	19.39	20.01	20.14	20.33	20.54	NOV 15
DEC 1	19.13	19.26	19.41	20.04	20.18	20.36	20.58	DEC 1
DEC 15	19.19	19.31	19.46	20.10	20.24	20.42	21.04	DEC 15

UTC SUNRISE TIMES IN PAPUA NEW GUINEA AND IRIAN JAYA

FREQ	POWER	FUT'R POWER	STATION NAME	STATION IDENT	CITY	SCHEDULE	COMMENTS
2.410	2.5	10.0 Step2	R. ENGA	Karai bilong Miok	Wabag	1945-2200 0645-1400	Sat/Sun 2300*
3.205	4.0	10.0 Step2	R. WEST SEPIK	Maus bilong Sandaun	Vanimo	1930-2000 0700-1400	
3.220	2.0	10.0 Step1	R. MOROBE	Maus bilong Kundu	Lae	1930-2130 0700-1400	
3.235	2.0	???? Step3	R. WEST NEW BRITIAN	Maus bilong Tavur	Kimbe	1900-2200 0730-1400	
3.245	10.0	10.0 Step2	R. GULF	Voice of the Seagull	Kerema	1900-2200 0700-1400	
3.260	2.0		R. MADANG	Karai bilong Garamut	Madang	2000-2200 0700-1400	
3.275	2.0	???? Step3	R. SOUTHERN HIGHLANDS	Karai bilong Muruk	Mendi	2000-2200 0700-1400	
3.290	2.0	10.0 Step2	R. CENTRAL	Radio Central	Boroko	2000-2200 0700-1400	BEIJING CO-CHAN!
3.305	10.0	10.0 Step1	R. WESTERN	Voice of the Sunrise	Daru	1930-2200 0700-1400	
3.315	2.0	???? Step3	R. MANUS	Maus bilong Chauka	Lorengau	1845-2130 0700-1400	
3.325	10.0		R. NORTH SOLOMONS	Maus bilong Sunkamap	Kieta	1900-2100 0700-1400	
3.335	10.0	10.0 Step2	R. EAST SEPIK	Nek bilong Sepik	Wewak	1945-2200 0700-1300	
3.345	2.0	???? Step3	R. NORTHERN	Voice of Oro	Popondetta	1930-2205 0630-1405	RRI TERNATE CO-CHAN!
3.355	2.0	10.0 Step2	R. SIMBU	Karai bilong Mambu	Kundiawa	1945-2200 0700-1400	
3.36~~0~~5	10.0	10.0 Step1	R. MILNE BAY	Voice of Kula	Alotau	1930-2200 0700-1400	
3.375	2.0	10.0 Step2	R. WESTERN HIGHLANDS	Nek bilong Tarangau	MountHagen	1945-2200 0700-1400	
3.385	10.0	10.0 Step2	R. EAST NEW BRITIAN	Maus bilong Tavuvur	Rabaul	1900-2130 0700-1400	RRI KUPANG CO-CHAN!!
3.395	2.0	???? Step3	R. EASTERN HIGHLANDS	Karai bilong Kumul	Goroka	2000-2200 0700-1400	RRI STATION CO-CHAN!
3.905	2.0	???? Step3	R. NEW IRELAND	Maus bilong Mai Mai	Kavieng	2000-2200 0700-1400	
4.890	10.0		P2T4 PORT MORESBY		Pt.Moresby	1930-2230 0630-1400	

ANTICIPATED TRANSMITTER CHANGES
NATIONAL BROADCASTING COMMISSION
PAPUA NEW GUINEA
SUMMER 1988

In Spring 1988, NBC received 11 new replacement transmitters from the Japanese manufacturer NEC. At this writing, these transmitters are all at Boroko under test. NBC anticipates that the first three of these 10 KW transmitters will go in service at Morobe, Western and Milne Bay during Fall 1988. This first distribution is noted in the data base to the left as "STEP 1." Distribution of the other eight transmitters is planned throughout 1989. This second wave is denoted "STEP 2" to the left. NBC also anticipates receiving another six NEC transmitters "in the future." This distribution is denoted "STEP 3."

Transmitters taken out of service will be a source of additional spare parts for the remaining old transmitters and "may" enable NBC to reactivate presently inactive outlets such as Port Moresby 3925 and 9520 and Rabaul 5985.

This information origonally from Gordon Darling on R. Australia's "Communicator," via David Clark.

PAPUA NEW GUINEA • STATION INFORMATION

FREQ	STATION NAME	WEST COAST RECEPTION	CENTRAL NAm RECEPTION	EAST COAST RECEPTION
2.410	R. ENGA	Seasonal	Seasonal and Diff.	VERY Difficult!!!
3.205	R. WEST SEPIK	Seasonal Regular	Weak Season Regular	Difficult
3.220	R. MOROBE	Difficult	Very Difficult	VERY Difficult (QRM)
3.235	R. WEST NEW BRITIAN	Seasonal Regular	Seasonal Weak	Seasonal Weak
3.245	R. GULF	Seasonal Regular	Seasonal Weak	Difficult
3.260	R. MADANG	Seasonal Weak	Difficult	Irregular and Weak
3.275	R. SOUTHERN HIGHLANDS	Regular	Seasonal Regular	Difficult (UTE QRM)
3.290	R. CENTRAL	Difficult	Extremely Difficult	Extremely Difficult
3.305	R. WESTERN	Regular	Seasonal Regular	Difficult
3.315	R. MANUS	Regular	Regular	Seasonal Regular
3.325	R. NORTH SOLOMONS	Regular	Seasonal Regular	Seasonal Regular
3.335	R. EAST SEPIK	Regular	Regular	Regular
3.345	R. NORTHERN	Very Difficult	Extremely Difficult	Extremely Difficult
3.355	R. SIMBU	Difficult	Very Difficult	Extremely Difficult
3.36^{5}0	R. MILNE BAY	Difficult	Very Difficult	Extremely Difficult
3.375	R. WESTERN HIGHLANDS	Regular	Seasonal Regular	Seasonal Regular
3.385	R. EAST NEW BRITIAN	Seasonal Regular	Seasonal Difficult	Regular
3.395	R. EASTERN HIGHLANDS	Seasonal Regular	Seasonal Weak	Very Difficult
3.905	R. NEW IRELAND	Regular	Seasonal Regular	Seasonal Regular
4.890	P2T4 PORT MORESBY	Strong Regular	Strong Regular	Strong Regular

PAPUA NEW GUINEA • RECEPTION INFORMATION

	HRD	QSL	FREQ	STATION NAME	NASWACOUNTRY	QSL RECORD LAST 5 YEARS	VERIFICATION SIGNER	TITLE	COMMENTS ON QSLING
	O	O	2.410	R. ENGA	New Guinea Territory	Erratic QSL'er	Gabriel Paiao (88)	Sta. Tech.	&v/s R.J.Namora(87)
	O	O	3.205	R. WEST SEPIK	New Guinea Territory	Good QSL'er	GabrielDeckwalen(88)	Sta. Manager	
	O	O	3.220	R. MOROBE	New Guinea Territory	Good QSL'er	A. R. Nase (88)	Sta. Manager	
212	O	O	3.235	R. WEST NEW BRITIAN #120	New Britian Islands	Good QSL'er	Simon Muraga (88)	Sta. Manager	
	O	O	3.245	R. GULF	Papua Territory	EXCELLENT !!!	Daniel Mailau (88)	Sta. Manager	&v/s Mark Auhora(88)
227	O	O	3.260	R. MADANG # 124	New Guinea Territory	Irregular and Rare Verifier	S.P. Tiori (87)	Asst. Manager	
348	O	O	3.275	R. SOUTHERN HIGHLANDS 70	Papua Territory	Good QSL'er	Jack Bata (88)	Sta. Manager	&v/s Ralph Moiun(87)
	O	O	3.290	R. CENTRAL	Papua Territory	Irregular and Rare Verifier	Ms Santo Willie (88)	Staff	&v/s Karl K Kila(87)
	O	O	3.305	R. WESTERN	Papua Territory	Irregular and Rare Verifier			
291	O	O	3.315	R. MANUS 155	Admiralty Islands	Good QSL'er	Eliun Sereman (88)	Sta. Manager	&v/s R.Karahure (87)
207	O	O	3.325	R. NORTH SOLOMONS 119	Bougainville Islands	Good QSL'er	S. Sawa (88)	Sta. Manager	&v/s R. Saini (87)
	O	O	3.335	R. EAST SEPIK	New Guinea Territory	Good QSL'er	Luke Lumbo (88)	Sta. Manager	
	O	O	3.345	R. NORTHERN	Papua Territory	Irregular and Rare Verifier	Misael Pendaia (88)	Sta. Manager	&v/s John Eggins(87)
	O	O	3.355	R. SIMBU	New Guinea Territory	Good QSL'er	Mau Ilave (87)	Sta. Manager	
224	O	O	3.36~~9~~5	R. MILNE BAY 70	Papua Territory	Few Reported	Trevor Webumo (87)	Sta. Manager	
	O	O	3.375	R. WESTERN HIGHLANDS	New Guinea Territory	Few Reported	Esau Okole (87)	Sta. Tech.	&v/s EdwardKenas(86)
213	O	O	3.385	R. EAST NEW BRITIAN 120	New Britian Island	EXCELLENT !!!	A.L. Rumina (88)	Sta. Manager	
	O	O	3.395	R. EASTERN HIGHLANDS	New Guinea Territory	EXCELLENT !!!	Kiri Nige (88)	Sen. Tech.	&v/s RobertTaula(87)
225	O	O	3.905	R. NEW IRELAND #123	New Ireland Island	Good QSL'er	Kathleen Sakias (88)	Asst. Manager	&v/s RobertTaula(87)
78	O	O	4.890	P2T4 PORT MORESBY 70	Papua Territory	Good QSL'er	Pomsie Pomat (87)		

PAPUA NEW GUINEA • QSL'ING INFORMATION

RADIO REPUBLIK INDONESIA
STATION INFORMATION
IRIAN JAYA

STATION	FREQUENCY (POWER)	SCHEDULE	COMMENT	WEST COAST RECEPTION	CENTRAL USA RECEPTION	EAST COAST RECEPTION
RRI JAYAPURA	5043v (unkn)	f/in to aprox 1445* Irregular	Also 6070 (20) (GOOD) & 9611.5 (7.5) (???)	Weak Irregular	Weak Irregular	Extremely Difficult
RRI NABIRE	5055.5 (1.0)	f/in to 1400*	Also 6127.5 at f/in to 0900*	Very Difficult (QRM)	Very Difficult	Extremely Difficult
RRI SERUI	4607.3 (0.5)	f/in to 1700*		Regular	Seasonal Regular	Difficult
RRI BIAK	5500.5 (1.0)	At times is 24h	Alt. freq: 5982.5 (1) & 5451 (1)	Strong Regular	Regular	Difficult
RRI MANOKWARI	3986a (1.0)	f/in to 1400*		Regular	Weak Regular	Weak Seasonal
RRI SORONG	4874.8v (10)	f/in to 1500*	Co-chan with V. of Jinling	Regular	Regular	Difficult
RRI FAK FAK	4790v (1.0)	f/in to 1400* on 4790v	Also 3644.8 at *1400	Regular	Weak Regular	Difficult
RRI MERAUKE	3905.2 (1.0)	f/in to 1400* sometimes later		Extremely Difficult	One Verified Logging	???Possible???
RRI WAMENA	4871v (0.5)	f/in to 1210*	Alt Freq: 5043.6(0.5)	Weak Regular	Weak Regular	Seasonal Regular

RADIO REPUBLIK INDONESIA - IRIAN JAYA
QSL'ING INFORMATION

HRD	QSL	STATION	QSL RECORD LAST 5 YEARS	VERIFICATION SIGNER	TITLE	COMMENTS
O	O	RRI JAYAPURA	ONE KNOWN QSL IN PAST 5 YEARS!	Harry Liborang (86)	-----	
O	O	RRI NABIRE	Irregular verifier	Sintike Nelwan (87)	Kepala Sub-Seksi	
O	O	RRI SERUI	Irregular verifier	Agus Raunsai(88)	Kepala Seksi Siaran	
O	O	RRI BIAK	Non-Verifier (few in 88)	Muchtar Yusapatera,BA (88)	Kepala Studio	V/S likes airplane magazines!
O	O	RRI MANOKWARI	Irregular QSL'er since early '80's	Abdul Rachim (87)		
O	O	RRI SORONG	Irregular Verifier	Ny.Tien Widarsanto (87)	-----	
O	O	RRI FAK FAK	Irregular and Rare Verifier	Embul Gani (88)	Kepala S. P. Tech.	Good Luck!!!
O	O	RRI MERAUKE	Meticulous Verifier	Eho Budi Sutoyo (88)	Kepala Teknik	V/S opened station in 1964
O	O	RRI WAMENA	FEW KNOWN QSL'S IN PAST 5 YEARS!	Yos Kumurawak (87)	-----	

The first print run of Proceedings 1988 was made on Thursday, July 28, 1988. On Saturday of that week, John Bryant received notification from Gordon Darling in Papua New Guinea of a totally new and radically different utilization plan for the 11 new NEC transmitters received by the National Broadcasting Commission in PNG. That weekend, Mr. Darling was interviewed on Radio Australia's "Communicator" and announced the new plan to the radio community. Since John was in direct contact with the printers, we decided to literally STOP THE PRESSES and ask the printer to rerun this page to include the latest information from PNG.

Two preliminary data bases of the new frequency plan are shown below. There are several small areas of confusion at this early stage, due to slight discrepancies between what was broadcast over RA and was Mr. Darling wrote to John several days prior to the broadcast. These are: 1) It is unclear whether R. Milne Bay is staying on 3365 or moving to 3360. 2) It is unclear also whether R. Southern Highlands at Mendi is staying at 2.0 Kw or getting one of the new 10 Kw units.

Mr. Darling stated that the reason for this radical new plan was to provide a minimum of 15 kiloHertz seperation between the new much more powerful units. Given the fact that most of local audience probably use relatively uncomplicated receivers, this frequency management strategy makes very good sence, indeed. The three Kundu Service stations moving to the 120 meter band to join Enga are all dropped rather neatly into unoccuppied slots except for 2490. That channel has two other East/Central Asian occupants...However, they do not have schedule overlaps with Kundiawa. After the change is complete, it will be obvious that the NBC strategy is also a move to be a "better neighbor" to stations in the region. Opening 3235 clears the channel for AIR Gauhati. Opening 3315 clears that channel for AIR Bhopal and solves adjacent channel QRM problems for several neighboring small stations. The move from 3325 to 3320 clears nearby RRI Palangkaraya but clobbers the much more distant Pyongyang outlet. Leaving the very crowded 3355 will help Noumea, Kuresong, Sumenep and others co-exist better. Leaving 3375 allows Medan and Gauhati to share that frequency more easily and the move from 3385 to 3380 assists nearby Kupang and RTM Miri, though it does land Rabaul attop RRI Malang. All in all, this rather radical new frequency plan should not only improve listening conditions for NBC's primary audience, but it should improve the general ease of listening to 90 Meter Band stations through the entire Southeast Asian Region. One hesitates to use the word "brilliant" concerning a frequency allocation plan....particularily one still slightly in flux. However, it's a superb plan, no doubt.

Mr. Darling cautions that the TARGET DATE for implementation is 5 September 1988. Events may cause individual stations to miss that date slightly.

The authors would like to thank Mr. Gordon Darling of Port Moresby for providing us with this late breaking information for inclusion in Proceedings 1988.

STOP THE PRESSES!!!!!!

ANALYSIS: THEN AND NOW

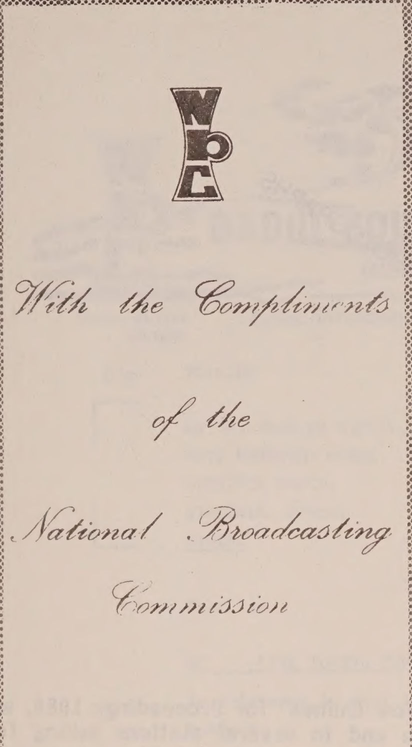
OLD FREQ	NEW FREQ	OLD POWER	NEW POWER	STATION NAME	CITY NAME
2.410	2.410	2.5	10.0	R. ENGA	Wabag
3.205	3.205	4.0	10.0	R. WEST SEPIK	Vanimo
3.220	3.220	2.0	10.0	R. MOROBE	Lae
3.235	2.435	2.0	10.0	R. WEST NEW BRITIAN	Kimbe
3.245	3.245	10.0	10.0	R. GULF	Kerema
3.260	3.260	2.0	10.0	R. MADANG	Madang
3.275	3.275	2.0	10.0	R. SOUTHERN HIGHLANDS	Mendi
3.290	3.290	2.0	10.0	R. CENTRAL	Port Mores
3.305	3.305	10.0	10.0	R. WESTERN	Daru
3.315	2.465	2.0	10.0	R. MANUS	Lorengau
3.325	3.320	10.0	10.0	R. NORTH SOLOMONS	Kieta
3.335	3.335	10.0	10.0	R. EAST SEPIK	Wewak
3.345	3.345	2.0	FP 10	R. NORTHERN	Popondetta
3.355	2.490	2.0	10.0	R. SIMBU	Kundiawa
3.36~~0~~5	3.365	10.0	10.0	R. MILNE BAY	Alotau
3.375	2.450	2.0	10.0	R. WESTERN HIGHLANDS	MountHagen
3.385	3.380	10.0	10.0	R. EAST NEW BRITIAN	Rabaul
3.395	3.395	2.0	2.0	R. EASTERN HIGHLANDS	Goroka
3.905	3.905	2.0	2.0	R. NEW IRELAND	Kavieng
4.890	4.890	10.0	10.0	P2T4 PORT MORESBY	Pt.Moresby

AFTER 5 SEPT 1988

FREQ	POWER	STATION NAME	CITY NAME
2.410	10.0	R. ENGA	Wabag
2.435	10.0	R. WEST NEW BRITIAN	Kimbe
2.450	10.0	R. WESTERN HIGHLANDS	MountHagen
2.465	10.0	R. MANUS	Lorengau
2.490	10.0	R. SIMBU	Kundiawa
3.205	10.0	R. WEST SEPIK	Vanimo
3.220	10.0	R. MOROBE	Lae
3.245	10.0	R. GULF	Kerema
3.260	10.0	R. MADANG	Madang
3.275	10.0	R. SOUTHERN HIGHLANDS	Mendi
3.290	10.0	R. CENTRAL	Port Mores
3.305	10.0	R. WESTERN	Daru
3.320	10.0	R. NORTH SOLOMONS	Kieta
3.335	10.0	R. EAST SEPIK	Wewak
3.345	FP 10	R. NORTHERN	Popondetta
3.365	10.0	R. MILNE BAY	Alotau
3.380	10.0	R. EAST NEW BRITIAN	Rabaul
3.395	2.0	R. EASTERN HIGHLANDS	Goroka
3.905	2.0	R. NEW IRELAND	Kavieng
4.890	10.0	P2T4 PORT MORESBY	Pt.Moresby

NBC•PNG'S NEW FREQUENCY PLAN

feature 2

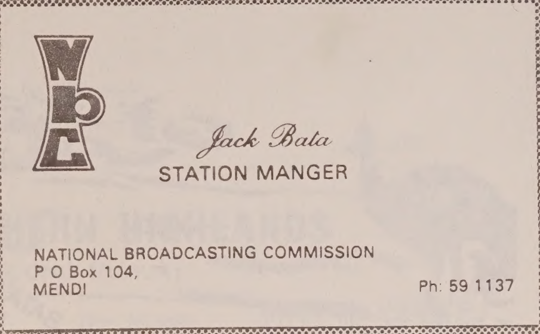


With the Compliments

of the

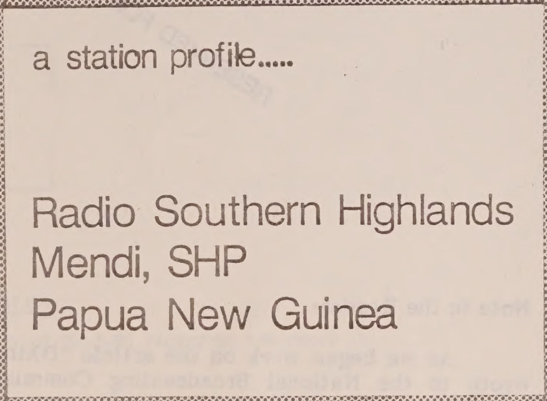
National Broadcasting

Commission



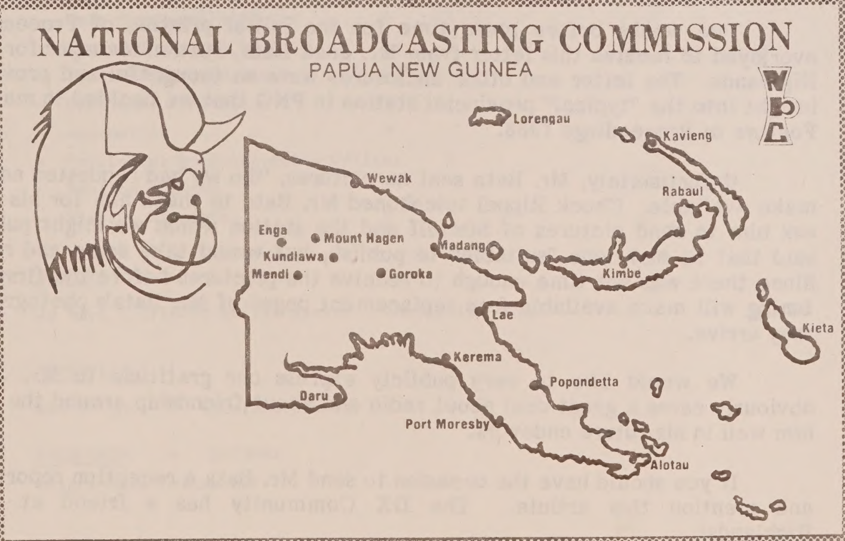
Jack Bata
STATION MANGER

NATIONAL BROADCASTING COMMISSION
P O Box 104,
MENDI
Ph: 59 1137



a station profile.....

Radio Southern Highlands
Mendi, SHP
Papua New Guinea



NATIONAL BROADCASTING COMMISSION
PAPUA NEW GUINEA

Lorengau
Kavieng
Wewak
Rabaul
Enga
Mount Hagen
Madang
Kundiawa
Mendi
Goroka
Kimbe
Lae
Kieta
Kerema
Popondetta
Daru
Port Moresby
Alotau

RESERVED FOR MR. BATA'S PHOTOGRAPHS

Note to the Reader:

As we began work on the article "DXing New Guinea" for Proceedings 1988, we wrote to the National Broadcasting Commission and to several stations asking for information concerning broadcasting in Papua New Guinea and for profiles of stations and station personnel.

Two weeks before press time for the initial printing of Proceedings, we were overjoyed to receive this letter from Mr. Jack Bata, Station Manager for Radio Southern Highlands. The letter and other enclosures were so thoughtful and provided us such an insight into the "typical" provincial station in PNG that we decided to make it a separate Feature of Proceedings 1988.

Unfortunately, Mr. Bata sent no pictures, 'tho we had requested any that he might make available. Chuck Rippel telephoned Mr. Bata to thank him for his courtesy and to ask him to send pictures of himself and the station which we might publish. Mr. Bata said that he had none "suitable" to publish, but would take some and rush them to us. Since there was not time enough to receive the prictures before the first press run, **fine tuning** will make available free replacement pages of Mr. Bata's photographs as soom as they arrive.

We would like to very publicly express our gratitude to Mr. Jack Bata. He obviously cares a great deal about radio and about friendship around the world. We wish him well in his future endevors.

If you should have the occasion to send Mr. Bata a reception report, please be sure and mention this article. The DX Community has a friend at Radio Southern Highlands!

Dr. Harold Cones   R. Charles Rippel   John H. Bryant

RADIO SOUTHERN HIGHLANDS
(NEK BILONG MURUK)
Ref: 10-5-

Phone: 59-1137
59-1020
Cables: NATBROADCAST
Telex: NE 52003
P.O. Box 104,
MENDI. S.H.P.
Papua New Guinea.

Date: 20-6-88

MR. R. CHARLES RIPPEL,
1272 PARKSIDE PLACE,
VIRGINIA BEACH,
VIRGINIA 23454,
U.S.A.

Dear Sir

RE - FINE TUNING PUBLICATION.

In reference to your letter of 20-3-88 regarding the above subject.

As at the 20/6/88 broadcast officers are the biggest group of officers working with Radio Southern Highlands:-

- Male Broadcast Officers	8
- Female Broadcast Officers	2
- Typists/Keyboard Operators	2 (females)
- Broadcast Technician	1
- Journalist	1
- Provincial Administrative Officer	1
- Station Drivers	2
- Station Cleaners	2

ANTENNA

We have a triadic aerial system (Australia Made)

TRANSMITTER

AWA - Type. (Australia Made)

FREQUENCY - 3275KHz
(Night time Frequency)

BAND

90 metre Short Wave Band

POWER

2,000 WATTS.

Our Daily transmission hours as follows:-

- MORNING BREAKFAST SHOW.
  - 0600-0800 hrs (PNG LOCAL TIME)
  - 20.00-22.00 (UTC/GMT Your local time)
- EVENING & LATE/NIGHT BROADCAST.
  - 1700-2400 hrs (PNG Local time)
  - 08.00-15.00 (UTC/GMT Your local time)
- BROADCAST LANGUAGE.

  We use at least five languages for broadcast.

  - English
  - Pidgin (National Language)
  - KEWAPI (Local dialect)
  - HULI (" ")
  - IMBONGU (" ")

The Station (Radio Southern Highlands) was openned on the 29/9/73 by the Chief Minister, Honourable M.T. Somare MHA for East Sepik Province and the Minister for Information Mr. Paulus Arek MHA.

Radio Southern Highlands is just one of the nineteen (19) Provincial Radio Stations in the Kundu Service of the National Broadcasting Commission of Papau New Guinea.
Radio Southern Highlands serves about 300,000 inhabitants of Southern Highlands Province.

VERNACULAR

Language Communication is one of the biggest problems in Papua New Guinea, because the people of our country speak more than 700 different dialects. It means that of the nineteen (19) districts or provinces which make up the country, a little tribal clan of an area has its own language to communicate, and that members of anotherclan which is just ten to twenty miles away have their own language.

Its terribly hard for the people to travel that far to communicate with members of another clan.

Consequently, Pidgin, Englsih and Motu are being used by the people as the National Languages.

For that reason and most of the nineteen (19) Provincial Radio Stations in the country are using more than one language for broaddast.

Note that we do not make commercial broadcast to our audience. Because the 19 Provincial Radio Stations are Governments' Stations that all our programme outputs are aimed at the rural people.

We have a lot of local music programmes like:

- String Bands
- Choir/Hymns
- Traditional Singsings

We also have extension programmes on our Radio Operational Schedules.

We have some very important extension programme like.

- Rural Programme
- Health Programme
- Education Programme (Schools Programme)
- Current Affairs Programme
- Sports
- Business Development Programme,
- Women's Programme
- Law & Order Programme
- Coffee Development Programme
- College of External Studies Programme
- High school Broadcast Programme

I hope I had given you just enough information on my Station for your article.

Yours Sincerely,

JACK BATA

Provincial Station Manager - RSH MENDI.

RESERVED FOR MR. BATA'S PHOTOGRAPHS

feature 3

IN PROGRESS.....

A REPORT FROM THE COMMITTEE TO PRESERVE RADIO VERIFICATIONS

JERRY BERG

In late 1986, a new ANARC committee--the Committee to Preserve Radio Verifications (CPRV)--was established in order to help save QSLs belonging to DXers who have either passed away or become inactive in the hobby. In the past, many such collections have been lost forever. Other family members seldom share an interest in radio, least of all the QSL-collecting aspects. Despite the time and effort spent on these collections, most of them are probably destined for a dusty attic or a wet basement if we're lucky, the trash heap if we aren't.

The committee set three main goals for itself: first, to cause more hobbyists to think about the long term importance of their QSL collections; second, to provide a central repository for QSLs of inactive or deceased DXers; and third, to serve as recipient for any QSL collections that hobbyists might wish to dispose of when they pass away.

Progress to date. How is the project doing in meeting these goals? Very well indeed.

Achievement of the first goal--getting more hobbyists to think about the long term importance of their collections--is being accomplished by a widespread publicity campaign about the committee's activities. Articles about CPRV have appeared in many radio club and antique radio collector bulletins, as well as Monitoring Times and Antique Radio Classified. Promotional pieces have also appeared in the 1988 World Radio TV Handbook and the WRTH Newsletter, Ham Radio magazine and Postcard Collector magazine. The CPRV has been featured on a number of DX programs, including Radio Canada International, Radio Australia, Radio Netherlands, HCJB, Radio Discovery and Glenn Hauser's "World of Radio". Hundreds of copies of the committee's brochure have been distributed to interested persons around the world.

These promotional activities have resulted in a wide variety of contacts with radio hobbyists, as well as others who have QSL cards in their possession (such as postcard collectors, most of whom know nothing about the QSL cards in their collections).

The committee has been very successful in its second goal, providing a repository for QSLs of inactive or deceased DXers. Such a depository has been established with the Christian Science Monitor, the internationally recognized news organization and parent of WCSN, the new 500 kw. international shortwave station in Scotts Corner, Maine. The Monitor has made filing space available to the committee at its modern downtown Boston headquarters.

Through its own initiatives with individual DXers and the families of DXers of the past, and as a result of inquiries from others, the committee has already archived nearly 12,000 QSLs. Most of these are SWBC and MW QSLs, though CPRV is an all wave project and thus includes in its holdings utility QSLs, plus some amateur QSLs (the committee accepts only pre-1950 amateur QSLs, and then only particularly distinctive items). Among these holdings are QSLs from the 20's right through the 80's, with an impressive array of rare QSLs from stations that ceased broadcasting long ago and that are unknown to most of today's hobbyists. All QSLs are entered in a computerized index, and filed by type and country at WCSN headquarters.

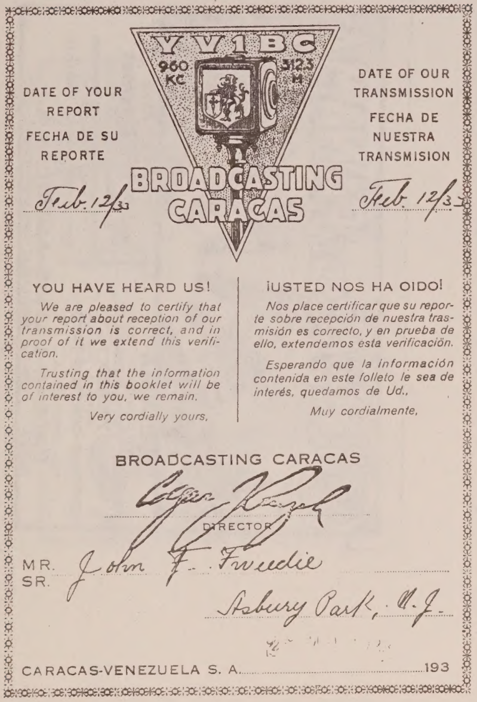
Although the establishment of this depository has been the CPRV's biggest project, the committee has also been working on the third goal, providing a means by which hobbyists may arrange now for the preservation of their collections at a point in the future when they may no longer able to enjoy them. The committee hopes to be able to announce soon the establishment of an innovative, easy, low cost, "no obligation" way for hobbyists to do this. Stay tuned.

The future. The committee will continue to be active in all of these areas in the future. One of its major activities will continue to be the contacting of individual DXers, and the families of deceased DXers, to determine whether they are interested in donating any QSLs that are in their possession. Such contacts have been extremely productive, and have resulted in the saving of a great quantity of material whose future was otherwise very bleak.

The committee also wants to keep its activities before the hobby so that QSLers will be reminded regularly of the committee's availability and the importance of future planning for one's QSLs. We have a number of ideas on how to do this while at the same time sharing widely some of the most interesting material in the committee's collection. Eventually the committee hopes to publish a book or otherwise make its material available for research and viewing by the hobby as a whole.

If you are interested in any aspect of the committee's work, contact one of its members. They are . . . Jerry Berg, Committee Chairman, 38 Eastern Ave., Lexington, MA 02173, tel. 617/861-8481 . . . Kent Corson, 4015 Tanglefoot Terrace, Bettendorf, IA 52722, tel. 319/355-7293 . . . Gerry L. Dexter, R.R. 4 - Box 110, Lake Geneva, WI 53147, tel. 414/248-4845 . . . Tom Gavaras, 10401 Cedar Lake Rd. (215), Minnetonka, MN 55343, tel. 612/544-2433 . . . and John C. Herkimer, 3233 East Ave., Caledonia, NY 14423, tel. 716/538-2582.

from the archives of CPRV.....


YV1BC
960 KC
312.5 M

BROADCASTING CARACAS

DATE OF YOUR REPORT
FECHA DE SU REPORTE
Feb. 12/33

DATE OF OUR TRANSMISSION
FECHA DE NUESTRA TRANSMISION
Feb. 12/33

YOU HAVE HEARD US!

We are pleased to certify that your report about reception of our transmission is correct, and in proof of it we extend this verification.

Trusting that the information contained in this booklet will be of interest to you, we remain.

Very cordially yours,

¡USTED NOS HA OIDO!

Nos place certificar que su reporte sobre recepción de nuestra trasmisión es correcto, y en prueba de ello, extendemos esta verificación.

Esperando que la información contenida en este folleto le sea de interés, quedamos de Ud.,

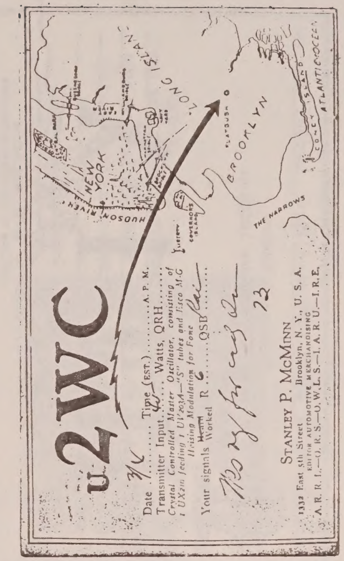
Muy cordialmente,

BROADCASTING CARACAS

DIRECTOR

MR.
SR. John F. Fredie
Asbury Park, N.J.

CARACAS-VENEZUELA S. A. 193

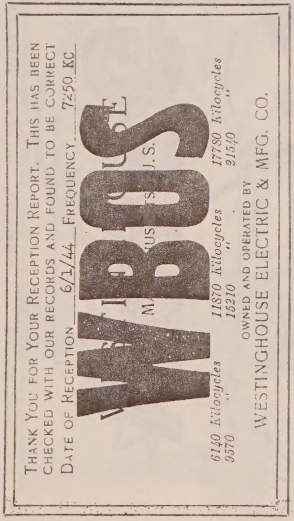

HUDSON RIVER
NEW YORK
LONG ISLAND
BROOKLYN
FLATBUSH
GOVERNORS ISLAND
LIBERTY
THE NARROWS
CONEY ISLAND
ATLANTIC OCEAN

U 2WC

Date 3/4 ...... Time (EST.) ......A. P. M.
Transmitter Input......Watts, QRH......
Crystal Controlled Master Oscillator, consisting of 1 UX210 feeding 1 UV203A—"S" tubes and Esco M-G Heising Modulation for Fone
Your signals ~~Heard~~ Worked R 6 ...... QSB ......

Tks vy fr cd 73

STANLEY P. MCMINN
1332 East 5th Street Brooklyn, N. Y., U. S. A.
EDITOR AUTOMOTIVE MERCHANDISING
A. R. R. L.—O. R. S.—U. W. L. S.—I. A. R. U.—I. R. E.


THANK YOU FOR YOUR RECEPTION REPORT. THIS HAS BEEN CHECKED WITH OUR RECORDS AND FOUND TO BE CORRECT
DATE OF RECEPTION 6/1/44 FREQUENCY 7250 KC

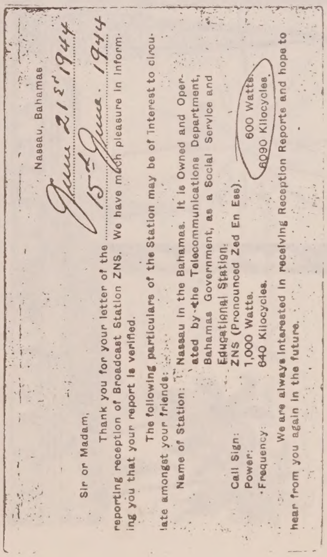
WBOS

6140 *Kilocycles*
9570 "

11870 *Kilocycles*
15210 "

17780 *Kilocycles*
21540 "

OWNED AND OPERATED BY
WESTINGHOUSE ELECTRIC & MFG. CO.


Nassau, Bahamas
June 21st 1944

Sir or Madam,

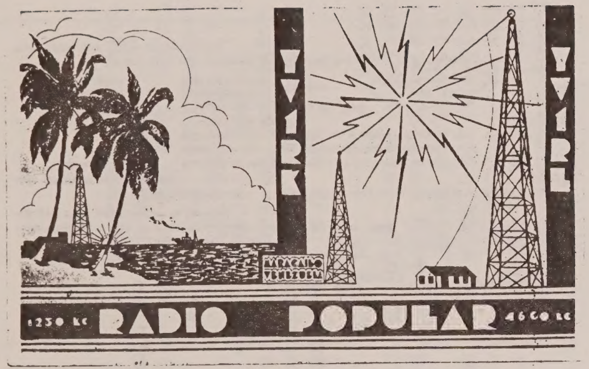
Thank you for your letter of the 15th June. 1944 reporting reception of Broadcast Station ZNS. We have much pleasure in informing you that your report is verified.

The following particulars of the Station may be of interest to circulate amongst your friends:

Name of Station: Nassau in the Bahamas. It is Owned and Operated by the Telecommunications Department, Bahamas Government, as a Social Service and Educational Station.
Call Sign: ZNS (Pronounced Zed En Ess).
Power: 1,000 Watts. 600 Watts.
Frequency: 640 Kilocycles. 6090 Kilocycles.

We are always interested in receiving Reception Reports and hope to hear from you again in the future.

from the archives of CPRV.....

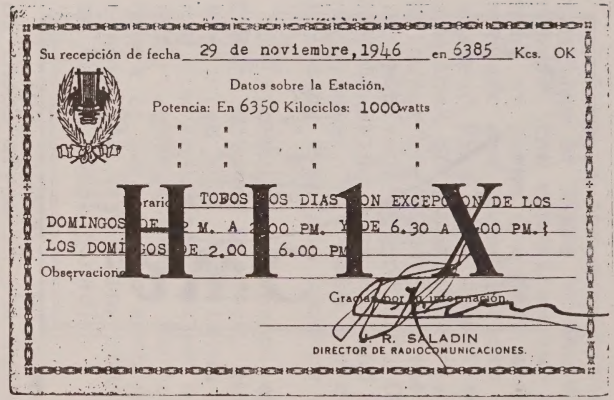


YV1RK

YV1RL

MARACAIBO
VENEZUELA

1230 KC RADIO POPULAR 4660 KC



Su recepción de fecha 29 de noviembre, 1946 en 6385 Kcs. OK

Datos sobre la Estación,

Potencia: En 6350 Kilociclos: 1000 watts

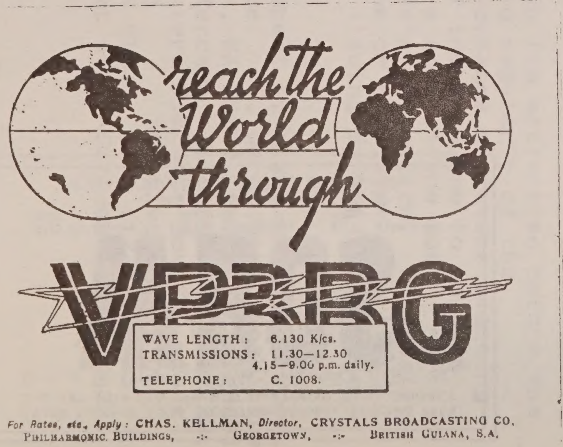
HI1X

Horario TODOS LOS DIAS CON EXCEPCION DE LOS
DOMINGOS DE [illegible] M. A 2.00 PM. Y DE 6.30 A [illegible].00 PM.)
LOS DOMINGOS DE 2.00 A 6.00 PM

Observaciones

Gracias por su información.

J. R. SALADIN
DIRECTOR DE RADIOCOMUNICACIONES.

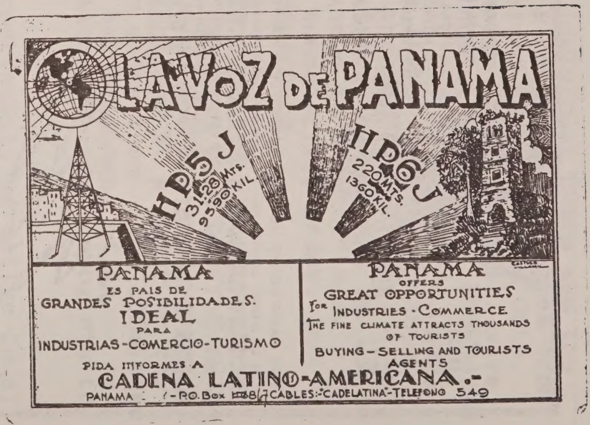


reach the World through

VP3BG

WAVE LENGTH: 6.130 K/cs.
TRANSMISSIONS: 11.30—12.30
4.15—9.00 p.m. daily.
TELEPHONE: C. 1008.

For Rates, etc., Apply: CHAS. KELLMAN, *Director,* CRYSTALS BROADCASTING CO.
PHILHARMONIC BUILDINGS, -:- GEORGETOWN, -:- BRITISH GUIANA, S.A.



LA VOZ DE PANAMA

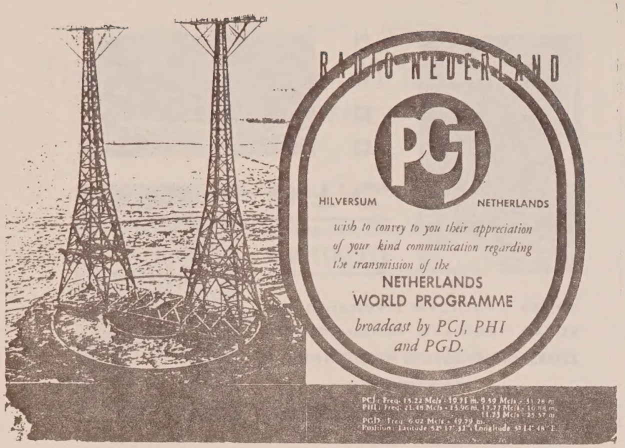
HP5J
31.28 MTS.
9590 KIL.

HP6J
220 MTS.
1360 KIL.

PANAMA
ES PAIS DE
GRANDES POSIBILIDADES.
IDEAL
PARA
INDUSTRIAS-COMERCIO-TURISMO

PANAMA
OFFERS
GREAT OPPORTUNITIES
FOR INDUSTRIES - COMMERCE
THE FINE CLIMATE ATTRACTS THOUSANDS
OF TOURISTS
BUYING - SELLING AND TOURISTS
AGENTS

PIDA INFORMES A
CADENA LATINO-AMERICANA.-
PANAMA - P.O. Box [illegible] CABLES: "CADELATINA" - TELEFONO 549



RADIO NEDERLAND

PCJ

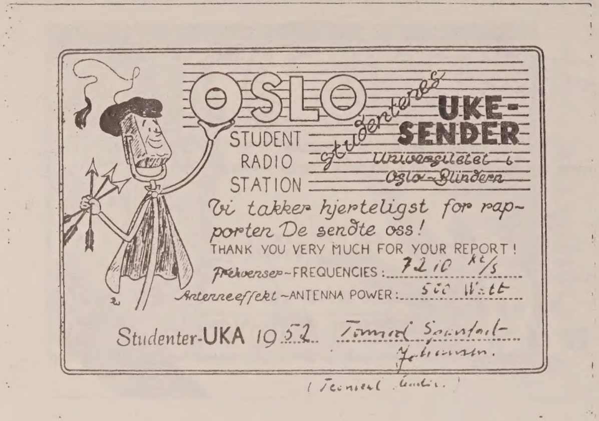
HILVERSUM NETHERLANDS

wish to convey to you their appreciation of your kind communication regarding the transmission of the

NETHERLANDS WORLD PROGRAMME

broadcast by PCJ, PHI and PGD.

PCJ: Freq. 15.22 Mc/s - 19.71 m. 9.59 Mc/s - 31.28 m.
PHI: Freq. 21.48 Mc/s - 13.96 m. 17.77 Mc/s - 16.88 m.
11.73 Mc/s - 25.57 m.
PGD: Freq. 6.02 Mc/s - 49.79 m.
Position: Latitude 52° 17' 32", Longitude 5° 14' 48" E.



OSLO studentenes UKE-SENDER

STUDENT RADIO STATION

Universitetet i Oslo-Blindern

Vi takker hjerteligst for rapporten De sendte oss!

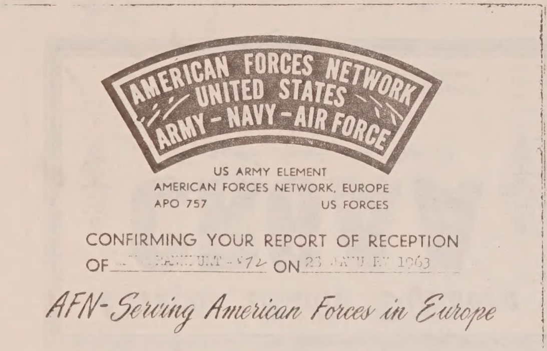
THANK YOU VERY MUCH FOR YOUR REPORT!

Frekvenser - FREQUENCIES: 7210 kc/s

Antenneeffekt - ANTENNA POWER: 500 Watt

Studenter-UKA 1952 Tormod Spurtaft-Johansen.

(Tecnical leader.)

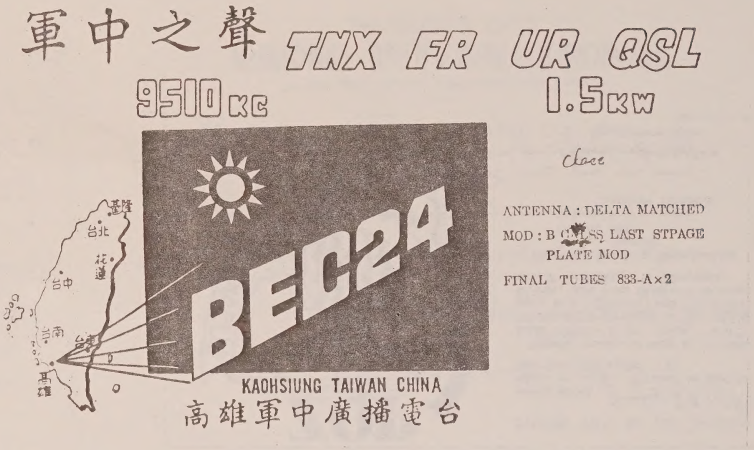


AMERICAN FORCES NETWORK
UNITED STATES
ARMY - NAVY - AIR FORCE

US ARMY ELEMENT
AMERICAN FORCES NETWORK, EUROPE
APO 757 US FORCES

CONFIRMING YOUR REPORT OF RECEPTION
OF [illegible] 572 ON 23 [illegible] 1963

AFN-Serving American Forces in Europe



基隆
台北
花蓮
台中
台南
高雄

軍中之聲 TNX FR UR QSL

9510 KC

1.5 KW

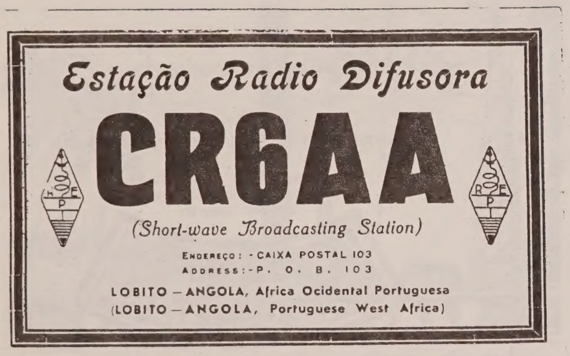
Chace

ANTENNA : DELTA MATCHED
MOD : B CLASS LAST STPAGE
PLATE MOD
FINAL TUBES 833-A×2

BEC24

KAOHSIUNG TAIWAN CHINA

高雄軍中廣播電台



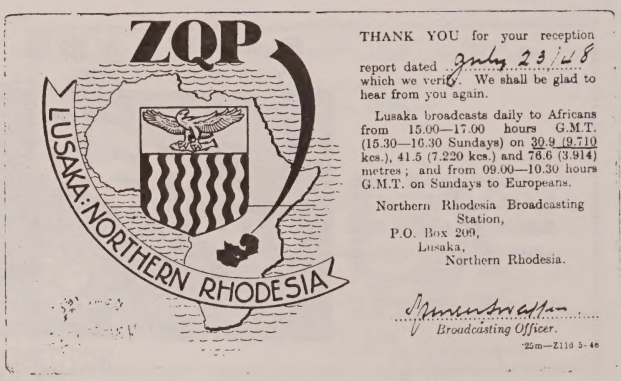
Estação Radio Difusora

CR6AA

(Short-wave Broadcasting Station)

ENDEREÇO: - CAIXA POSTAL 103
ADDRESS: - P. O. B. 103

LOBITO — ANGOLA, Africa Ocidental Portuguesa
(LOBITO — ANGOLA, Portuguese West Africa)



ZQP
LUSAKA: NORTHERN RHODESIA

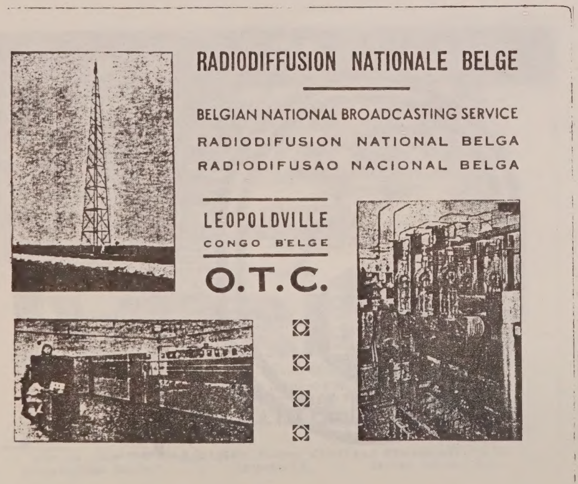
THANK YOU for your reception report dated July 23/48 which we verify. We shall be glad to hear from you again.

Lusaka broadcasts daily to Africans from 15.00—17.00 hours G.M.T. (15.30—16.30 Sundays) on 30.9 (9.710 kcs.), 41.5 (7.220 kcs.) and 76.6 (3.914) metres; and from 09.00—10.30 hours G.M.T. on Sundays to Europeans.

Northern Rhodesia Broadcasting Station,
P.O. Box 209,
Lusaka,
Northern Rhodesia.

Broadcasting Officer.

25m—Z110 5-46

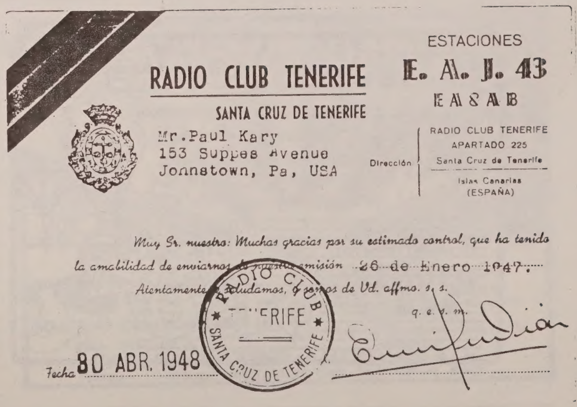


RADIODIFFUSION NATIONALE BELGE

BELGIAN NATIONAL BROADCASTING SERVICE
RADIODIFUSION NATIONAL BELGA
RADIODIFUSAO NACIONAL BELGA

LEOPOLDVILLE
CONGO BELGE

O.T.C.



RADIO CLUB TENERIFE

SANTA CRUZ DE TENERIFE

ESTACIONES
E. A. J. 43
EA8AB

Mr.Paul Kary
153 Suppes Avenue
Johnstown, Pa, USA

Dirección

RADIO CLUB TENERIFE
APARTADO 225
Santa Cruz de Tenerife
Islas Canarias
(ESPAÑA)

Muy Sr. nuestro: Muchas gracias por su estimado control, que ha tenido la amabilidad de enviarnos de nuestra emisión 26 de Enero 1947.

Atentamente le saludamos, y somos de Vd. affmo. s. s.

q. e. s. m.

Fecha 80 ABR. 1948

from the archives of CPRV.....

RADIO BRAZZAVILLE

VERIFICATION CARD

RADIO INTERNATIONAL

34, GOYA STREET, TANGIER, INTERNATIONAL ZONE, MOROCCO

We acknowledge your listening report of May 15- 1949

RADIO INTERNATIONAL *is a commercial radio station, broadcasting*ˣ *on medium waves (1238 kcs., 10000 watts) and short waves (6.200 kcs., 1000 watts).*

We broadcast from 13.00 to 16.00 hours, and from 19.00 to 24.00 hours every day.

Programs in four languages: French, Spanish, Arabic and English.

Many thanks for your report.

الراديو الدولي
RADIO INTERNATIONAL
DIRECTOR

x now 6,110 Kcs.

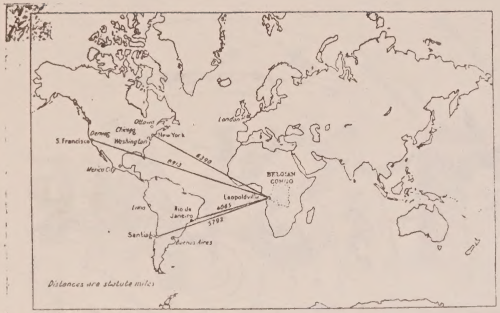
Best wishes, + many thanks. .

ALGIERS, ALGERIA, NORTH AFRICA

THE VOICE OF AMERICA

IN NORTH AFRICA

We are pleased to confirm your report of reception
of our station on 31.22 m., 9610 kc.,
Nov. 16 1946, at 1900 hours, G.M.T.


S. Francisco
Denver
Chicago
Ottawa
New York
Washington
Mexico City
Lima
Rio de Janeiro
Santiago
Buenos Aires
London
BELGIAN CONGO
Leopoldville
6390
6913
6065
5792
Distances are statute miles

The BELGIAN BROADCASTING SERVICES is now operating from London, New York and Leopoldville.
In Leopoldville (Belgian Congo, Africa) it has its own short wave station with a power of fifty kilowatts. The broadcasts from Leopoldville to the Americas are on ~~11.650~~ 9.785 kilocycles, or ~~25.75~~ 30.66 meters.

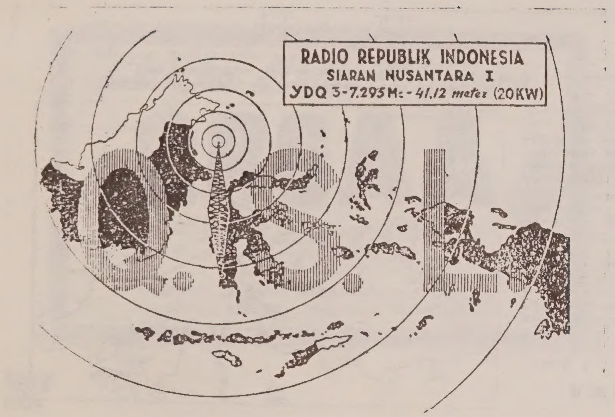
B. B. S.

The B. B. S., New York office of the Belgian National Broadcasting Services at the present time in London gratefully acknowledges your report on the recent test programs of its Leopoldville station in the Belgian Congo, Africa.

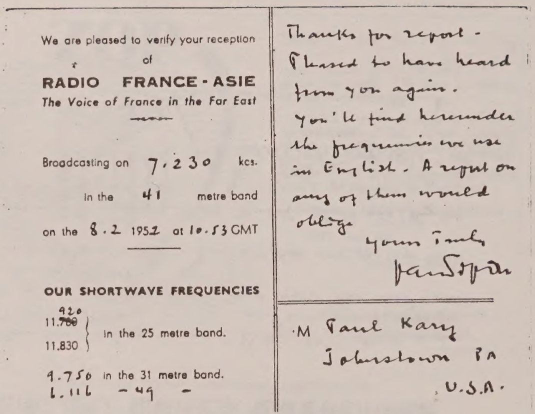
We hope that very soon our voice is heard again, not only from England, the United States, and the Belgian Congo but also from our liberated country of Belgium.

We thank you again for your courtesy which has been most helpful and is indeed very much appreciated.

from the archives of CPRV.....



RADIO REPUBLIK INDONESIA
SIARAN NUSANTARA I
YDQ 3-7.295 Mc - 41.12 meter (20KW)



We are pleased to verify your reception
of
RADIO FRANCE-ASIE
The Voice of France in the Far East

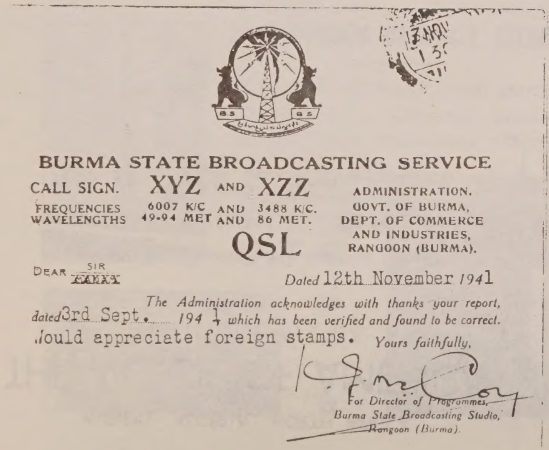
Broadcasting on 7.230 kcs.
in the 41 metre band
on the 8.2 1952 at 10.53 GMT

OUR SHORTWAVE FREQUENCIES

11.~~780~~920
11.830 } in the 25 metre band.
9.750 in the 31 metre band.
6.116 - 49 -

Thanks for report -
Pleased to have heard
from you again.
You'll find hereunder
the frequencies we use
in English. A report on
any of them would
oblige.
Yours truly,

M Paul Kary
Johnstown PA
U.S.A.



BURMA STATE BROADCASTING SERVICE

CALL SIGN. XYZ AND XZZ
FREQUENCIES 6007 K/C AND 3488 K/C.
WAVELENGTHS 49·94 MET AND 86 MET.

ADMINISTRATION.
GOVT. OF BURMA,
DEPT. OF COMMERCE
AND INDUSTRIES,
RANGOON (BURMA).

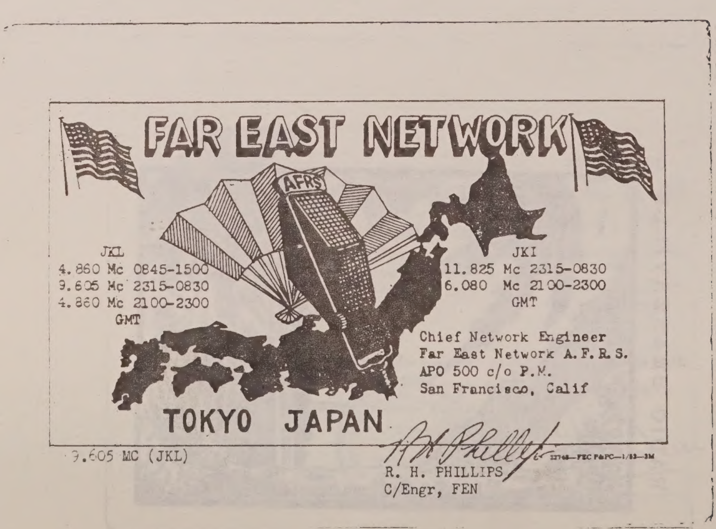
QSL

DEAR SIR ~~XXXXX~~

Dated 12th November *194*1

The Administration acknowledges with thanks your report, dated 3rd Sept. *194* 1 *which has been verified and found to be correct.*
Would appreciate foreign stamps. *Yours faithfully,*

For Director of Programmes,
Burma State Broadcasting Studio,
Rangoon (Burma).



FAR EAST NETWORK

JKL
4.860 Mc 0845-1500
9.605 Mc 2315-0830
4.860 Mc 2100-2300
GMT

JKI
11.825 Mc 2315-0830
6.080 Mc 2100-2300
GMT

Chief Network Engineer
Far East Network A.F.R.S.
APO 500 c/o P.M.
San Francisco, Calif

TOKYO JAPAN

R. H. Phillips

9.605 MC (JKL)

R. H. PHILLIPS
C/Engr, FEN

22768—FEC P&PC—1/53—3M

feature 4

A RESOURCE FOR SHORTWAVE BROADCAST DXERS
MEDIUM WAVE DX PUBLICATIONS

JOHN H. BRYANT

I began my radio hobby as a 13 year old in the early 1950's when my father gave me a war surplus shortwave radio. Like many of the rest of us, I largely invented the shortwave DXing hobby for myself. After about a year of SWBC DXing, I jumped ship to MW DX because my two closest friends had "invented" that hobby and could not afford anything more than five tube table model MW-only receivers. For the next six years, I was a very active MW DXer, eventually verifying 45 states and over 400 stations on three continents from a location in central Oklahoma! I was also co-host for the 1957 convention of the National Radio Club held in Ponca City, Oklahoma. In 1959, college, marriage, family and the early years of a career all began to intervene and the radio hobby was abandoned for twenty years.

In 1979, for any number of reasons, I decided to rejoin the active DXing community. However, due to my professional interest in Asia, I decided to become active again as a shortwave rather than medium wave DXer. I did so with growing relish and have remained a very active SWBC DX'er since. When I rejoined the hobby of SWBC DX, it was about as I knew it in the early 1950's, though better organized through the efforts of NASWA, DSWCI and others. By 1979, solid state and digital frequency readout equipment was beginning to make things easier, but in most other areas, the hobby was much the same as it had been 20 years earlier - - a truly intriguing avocation.

After a few years of intensive SWBC DX, I contacted the National Radio Club (mostly for nostalgic reasons) about becoming a member. Unfortunately, they sent me the catalogue of reprints from their past bulletins. By reading the titles, I could tell that MW DXing was a radically different affair in 1982 from what it had been in 1959. A revolution - no several revolutions - had taken place in almost every aspect of the hobby. The entire hobby had become more sophisticated by several orders of magnitude!

Furthermore, this new sophistication was readily available to anyone through their Reprint Service. Reading through the titles, it seemed to me that much of the new work from medium wave was very applicable to SWBC DX. Thus began a journey that continues to this day. To date, I have read almost 400 articles written by and for the medium wave hobby community. Of that number, almost half have relevancy to SWBC DXing.

In the intervening years, I discovered that not one but two strong MW clubs exist in North America. The other is International Radio Club of America. IRCA, like NRC has been in the forefront of the generation-long revolution in MW DXing. Eventually, I joined IRCA rather than NRC, because of personal friendships which developed with some of the IRCA leaders.

As we in **fine tuning** began to develop the concept for Proceedings, I felt that one of the largest services I could perform for the SWBC DX community was to help break down the unintended wall that has risen between our hobby and "the medium wavers". It was not a wall built by animosity. It was built by acreation and we are all penalized by its existence.

As an overview, I offer the following "down-home" analysis of developments in the Medium Wave DX revolution in the thirty years since I left it (gee! was it really that long?).

Antennas:

When I was a medium waver, one simply hung up a long random wire and DX'ed away. There have been two major developments: Loops and Beverages. Loops, usually around 3' to 4' diameter air core loops, have been resurrected from the 1920's. Ferrite core loops of considerably smaller dimension and usually highly amplified have also been developed. I believe that the air-core effort was begun by Gordon Nelson, but it has been carried on with great intensity by a whole generation of DXers. BCB literature is full of plans for various sizes and styles of loops, complete with plans for matching homebrew solid state RF amplifiers. Loops are said to be effective "up to about 6 MHz", however very little is commonly known about loop performance on the Tropical Bands. Hopefully, some SWBC DXer will take up the banner and explore this area of research. The second major antenna development is the emergence of wave, or Beverage, antennas as the antenna of choice for serious DXing. Again, a whole host of senior DXers have been involved in adapting this antenna originally developed in the early days of radio. The most notable MW Beveragers appear to have been Gordon Nelson, Bill Bailey, Mark Connelly, Chuck Hutton, and two Canadian DXers, Don Moman and Nick Hall-Patch. The Beverage has been used by a few shortwave DXers, including this author, with great success. It appears that the Beverage can be very effective on 90 meters and reasonably so up to "about 6 MegaHertz." If you want to hear 250 watt Andeans or Indonesians with near studio quality, "go to school" with the medium wavers and then put up a Beverage!

Propagation

The propagation information available to the average BCB DXer outshines that available to us for the higher bands. And again, Gordon Nelson appears to have been the pioneer. If you really want an education in propagation theory, read all of Gordon's reprints from NRC and IRCA. Not all of his work will apply to shortwave, but a very significant amount is relevant. Gordon's pioneering work has been furthered and expanded by a number of other senior DX'ers, most importantly, Father Jack Pejza and in recent years, Randy Seaver. For those of us interested in Tropical Band Propagation and propagation along high-latitude and transpolar routes, the medium wave work is "requried reading." A number of other senior DX'ers, especially Bruce Portzer, have done very useful work relating DX conditions to solar and geomagnetic conditions. Much of this work appears relevant to Tropical Band DXing.

Receivers:

Information on modern receiver design and construction is probably most readily available in the amateur radio community. However, in the MW community both Hall-Patch and Worcester have built formidable DX machines and describe their efforts in significant articles.

Information on receiver modification is also most readily available in the medium and long wave communities. It seems that the drive to get the last possible percentile of selectivity, flexibility, and to a certain degree sensitivity, from a receiver is fueled by low frequency devotees who often must DX under almost impossible circumstances.

Receiver reviews, most especially those by Don Moman, are probably of equal quality between the two hobbies. Regretfully, reprints of these reviews are only available through the MW clubs.

Peripheral Equipment:

The medium wave group seem to be rather far in the lead in this area. Mark Connelly has been the most prolific designer/experimenter/author in the area of homebrew antenna tuners and "phasing units." Others have published significant work in this area, as well. Unfortunately, most of these items, by their circuit design, only work well at medium frequencies. Tuners are widely available to the SW hobby, of course. However, "phasing units," currently unavailable to SWBC DXers, combine signals from two antennas, cancelling unwanted QRM and QRN by adding the two signals together out of phase. The use of these units on the crowded lower shortwave bands appears to offer much promise. Many senior medium wavers are convinced that phasing units WILL NOT work above 2 MHz at least. They are totally unaware that W1WSR published two books on the use of phasing units and multiwire Beverages up to 7 MHz, one over a decade ago. This is a perfect example of the artificial walls that have separated us for too long!

Tuning Strategies:

A good deal of material is available from both NRC and IRCA on "how to" DX. Most of this, unfortunately, is applicable only to medium wave. However, Mark Connelly's "Zonal Analysis" approach to DXing appears very applicable as a strategy for SWBC DX.

An Observation:

It may seem as if I find our hobby hopelessly archaic compared with the medium wave crowd. Heck no! But, I do feel that there are a number of significant areas of our hobby that could be strengthened measurably by learning from our lower frequency cousins.

I might add that there are several areas where the medium wavers could benefit from our knowledge and that of our amateur radio colleagues. These include QSLing techniques. Although there is a bit of information available on QSLing techniques in medium wave circles, this area of their hobby appears to be woefully neglected. Further, I have never seen a review or even much mention of "The Secrets of QSLing" by Gerry Dexter in the medium wave press. Although foreign language report forms are available in the medium wave hobby, they are noticeably inferior to those available in shortwave. There also has been no review that I have seen of Dexter's fine "Language Labs" in the medium wave press. Finally, in the area of computer utilization, although a few have applied main frame machines to some of the big problems, the medium wavers seem strangely far behind even us in SW DX in applying the home computer and software revolutions to their hobby.

Notes on the Process:

Since this bibliography task fell to me and since I was an IRCA member, I requested and was granted the privilege of reviewing all of the reprints from IRCA. My purpose was to determine the relevancy of these reprinted articles for those of us involved exclusively in SWBC DX. Some of these articles were already in my possession. Copies of the remainder were loaned to me by IRCA's Phil Bytheway for the purpose of this review.

IRCA currently offers about 400 reprinted articles. Of this group, an even 200 were eliminated by their title/brief catalogue description and were not even read. These included such things as various lists of domestic and foreign medium wave stations, receiver modifications which enhanced only medium wave performance, etc. I read each of the remaining 183 articles and decided which were relevant to SWBC DXing. Many of these judgements were obvious and easy, but a few were quite difficult. If I was unsure, I chose to err on the side of NOT including the article in this bibliography. This was done to assure SWBC DXers who might wish to purchase these articles from this list that every article in the bibliography was relevant to their interests/needs. However, this conservative approach undoubtedly has caused the elimination of a few articles which would have been of real interest to a few SWBC DXers.

Specifically, since no senior SWBC DXer is known to be DXing regularly on a loop. Therefore, no loop articles are included in this bibliography. I sincerely hope that a few of us SWBC types give this area of research some attention. Further, large "floppy", loops are represented in the bibliography by only one of about six available articles. If you have any interest in exploring the use of loop antennas on the Tropical Bands, write for the full reprint catalogue, from both medium wave clubs.

One other major "gray" area was left out of the list. Articles dealing with "homebrew" equipment fabrication (peripheral equipment and receivers) were left off the list unless the circuits, as shown, were useful in the shortwave spectrum. If you are accomplished enough at circuit design to attempt circuit modification, you should pursue the full lists from IRCA and NRC.... much good work has been done.

Finally, there is one whole area of endeavor included in this bibliography which is rapidly becoming technologically obsolete. Several authors, especially Pejza and Fischer, have done Trojan work detailing methods of hand calculating sunrise/sunset times, Great Circle bearings and distances, grayline targets, and other mathematically definable elements of DXing. Computer programs which perform some of these tasks have been available to the hobby community for some time. Last year, John DeVoldere, ON4UN, the author of the superb "Low Band DXing" (ARRL) made available software which will probably eventually revolutionize the way most of us DX. The software contains programs for all of the above functions and many more besides. DeVoldere, the ham community's pre-eminent Low Bander/Grayliner is offering the software configured for almost any 128 K machine (ARRL for $20.00). The existance of this software almost caused me to not include the hand calculation articles in the bibliography. However, there are still some SWBC DX'ers who cannot arrange even occasional access to a 128 K machine so the articles are included here.

After my own oddessy through nearly 400 radio articles, I only hope that we can begin to dismantle the accidental walls that seem to separate the three major radio hobbies. There is just no need for any of us to have to re-invent the wheel!

fine tuning hopes to be able to publish a similar bibliography of NRC reprints in the near future. In the meantime, full listings of all reprints from both organizations can be obtained from the addresses listed below. You are encouraged to include a #10 SASE and $1.00 to cover copying and handling costs:

NRC Publication Center
P.O. Box 164
Mannsville, New York
13661

IRCA Goodie Factory
P.O. Box 21074
Seattle, WA
98111

IRCA ARTICLE REPRINTS OF INTEREST TO SHORTWAVE DXERS

A BIBLIOGRAPHY

Quite a few articles have appeared in the International Radio Club of America's weekly Broadcast Band DX publication, **DX Monitor,** since the club first started in 1964. This is the list of reprints of interest to SW listeners which are currently available. Numbers in parenthesis are the total number of pages contained in the reprint.

ANTENNAS

A11 **The Super Signal Snatcher** (4) Dave Fischer. Theory on the set up and operation of a Beverage antenna (a very long wire), with tables and graphs. Gives careful study to reception patterns (lobes and nulls) and the advisability of terminating the far end of the antenna. Gives proper values for terminating resistors. 12/72

A19 **Some Thoughts on Beverages** (1) H. John Clements. An experienced Beverage user gives some practical hints to potential Beverage antenna builders. 4/78

A24 **DXing with the "DX Flyers"** (1) Gerry Thomas/Charlie Barfield. An interesting article dealing with erecting a 650' longwire antenna suspended from a kite. Deals only with resulting MW signal enhancement, but has obvious SWBC relevancy. 10/79

A25 **The KRS All-Band "Active" Antenna** (1) Mike Hardester. A brief, but thorough review of Radio West's active antenna. 7/80

A26 **Random Length Antennas** (1) Bruce Portzer. This article makes an important point about the vertical directivity of random wire antennas and their tendency to favor skywave over ground wave propagation. 10/80

A34 **The MFJ-1020 Indoor Active Antenna** (1) Randy Tomer. Review. 7/81

A41 **Defeating Atmospheric Interference by Underground Antennae** (1). Short introduction with description of two techniques. 1/82

A42 **The Practical Beverage Antenna** (1) Don Moman. Author describes time saving techniques used to create "instant" Beverage antennas. If you have always dreamed of one of these beauties on 90 meters but were worried about "the details", this article is for you. 3/82

A43 **Large-Area Loops for High-Noise Environments** (1) Glenn Kippel/Steve McGreevy. These are the short articles which cover all the basics of so-called "Floppy Loops." These loops can be tuned throughout the Tropical Bands and exhibit some directional characteristics. 3/82 and 6/83

A44 **Yaesu FRT-7700, FRA-7700, Grove Signal Match TUN-2** (2) Sheldon Remmington/Randy Tomer/ Don Moman. Reviews and a comparison of the FRT-7700 Passive Tuner, FRA-7700 Active Antenna and SW Horizon's Receiver-Antenna Interface #1. 7/82 and 2/83

A46 **A Simple Guide to Beverage DXpeditions** (1) Doug Nyholm. An introduction to planning a Beverage DXpedition, including equipment and some theory for the layman. An excellent article for both beginning and advanced Beveragers. 3/83

A50 **The 'APT-2" Active Antenna Tuner** (9) Mark Connelly. Complete details and diagrams for the construction and use of an active parallel tuner with regeneration for use with wires 2'/0.6m to 1000'/305m (150khz - 8Mhz). Layout and step-by-step construction are included, as well as instructions for use. Excellent for advanced builders. 11/83

A55 **The BBA-1 Broadband Amplifier** (5) Mark Connelly. Details for construction and operation of a 15db broadband (100 khz to 30 Mhz) amplifier for use in systems where knob tweeking is to be kept to a minimum. Excellent for advanced builders. 3/84

A60 **Some Antenna Experiments** (2) W.R. McIntosh. Description of the "Helical Longwire", a loop sized 293'/89m coil. Results are presented using different antenna tuners. 6/84

A63 **An RF Notch Filter** (1) Don Moman. Schematic for a tunable RF filter which will provide a 45db notch. This is an inexpensive, easy to construct outboard notch filter and is a real boon under crowded band conditions. 10/84

A66 **RT-1 Remotely Controlled Antenna Tuner** (3) Mark Connelly. Complete description and schematics for a varactor diode remotely tuned antenna (up to 50'/15m). This remote tuner covers 140 khz to 6300 khz and is excellent for the advanced builder. 1/85

A67 **Notes on Mediumwave Beverage Antennas** (3) Nick Hall-Patch/Don Moman. Summary of experiments done on Beverage termination, directional effects, construction and length. Brief description of the effect of two phased Beverages as well. Although most of the experiments are related to MW reception, this article is MUST reading for any Tropical Banders interested in Beverages. 1/85

A70 **The Mitchell Lee Loop Amplifier** (5) Mark Connelly. Two versions are described, one for use with loops, the other with tuned circuits for LW, BCB and Tropical Band DXing. 3/85 and 9/85

A80 **Heathkit Model HD-1424 Active Antenna** (1) Karl Zuk. Product review. 2/87

A85 **Phasing Network for Beverage Antennas** (1). Reprint of an FCC paper describing a phasing network for Beverage antennas at their Powder Springs, GA monitoring station.

FOREIGN

F26 **Time Pips as an Aid to IDing TP's** (2) Nick Hall-Patch/Bruce Portzer. Discussion on identifying the time pips used by Pacific, Asian and European stations. An excellent aid for SWBC DXers, as well as international Medium Wavers. 9/77

F30 **Spotlight on Soviet Far East** (3) Randy Seaver. Very informative discussion of Soviet Far East BCB stations including schedules and identifying practices. Although this article deals only with MW, it could be of real assistance to those SWBC DXers specializing in Soviet domestic broadcasting. 10/77

F35 **How to Pronounce Korean, Chinese and Spanish** (1) Bruce Portzer/Bill Harms. Three short articles to help understand how these languages sound. 10/79

F44 **A Trans-Atlantic DXers Guide to Sunrise and Sunset Times** (2) Mark Connelly. A technique is described for estimating times to listen for TAs based on the sunrise at the station and sunset at the listener. Tables for TA sunrise and US sunset times are included. Also Latin American sunrise chart is included. 2/80

F47 **The DXers Guide to China** (5) Bruce Portzer. Everything you wanted to know about broadcasting in China including pronunciation guide, map, list of stations, schedules and formats. Even though this article concentrates on Medium wave outlets, anyone interested in domestic Chinese SW broadcasting will find this article very useful. See also F50. 10/80

F48 **A Guide to DXing Korea** (3) Bill Harms. A very complete guide to broadcasting in Korea. Networks, IDs and QSL policies are discussed. Includes a list of stations. This article can be of assistance to SWBC DXers interested in regional Korean broadcasting. 2/81

F50 **Random Remarks on Chinese Broadcasting** (3) Pete Taylor. Comments and information on Chinese broadcasting with station lists, maps, and program information. This article is a companion to F47. 3/81

F56 **TA DX from West Coast North America** (4) Nick Hall-Patch/Bruce Portzer. A very complete analysis of TA reception from the West Coast. Receptions are tabulated by zones and discussed in detail. Although this study deals exclusively with Medium wave reception, Tropical Band SWBC DXers interested in propagation through or near the auroral zone will find this excellent study very useful. 2/82

F64 **A Cross-Index of China** (4) Art Peterson. Complete listing of the new Pinyin and the older Wade-Giles spelling of Chinese cities with latitude/longitude of each. 12/82

GENERAL

G2 **Noise** (1) Lawrence Foster/John Kalpus. Discussion of eliminating various types of noise, including fluorescent lamp noise. This article should prove most useful to Tropical Band DXers. 12/67

G3 **Sunrise/Sunset Maps** ($2.00) Father Jack Pejza/Ernie Wesolowski. 24 maps showing sunset and sunrise times for the US and the World. Includes explanation of their use and examples of DX made possible by a knowledge of SR/SS times. These maps are a good low cost alternative (1/10th as much) to the "DX Edge" or the ON4UN software available through ARRL.

G5 **Computation of Sunrise and Sunset Times** (14) Father Jack Pejza. Tables and instructions for computing the exact time of sunrise and sunset for latitudes up to 60 degrees N and S, throughout the year. 12/73

G12 **All You Wanted to Know about Running a Radio Club Convention But Didn't Know Who to Ask** (12) Father Jack Pejza. An experienced convention host gives suggestions, ideas and warnings. Includes news release and souvenir examples.

G14 **Morse Code Identification** (1) Larry Godwin. Techniques for using Morse Code to ID testing stations. Also includes the code alphabet. 2/70

G18 **Sunrise, Sunset, and the Shortest Day of the Year** (1) Bill Hardy. Explains why the length of the day and the time of sunset don't necessarily jibe directly. Also talks about how a DXer can take advantage of it. This article will be of particular interest to Tropical Band DXers who are interested in sunrise/sunset enhancement and "greylining". 12/75

G20 **World Time Chart** (1). World map showing all time zones and the letter designation of each. 1/77

G30 **Some Random Notes on Sunrise Skip** (1) Robert Kramer. Discussion of sunrise skip and how it can be used to hear new stations. Good list of guidelines provided. 10/81

G31 **Time Documentation of DX** (3) Charles R. Smiley, Jr. Author describes two techniques for recording time information on a stereo recorder. 8/82

G34 **DX Edge** (1) Sheldon Remmington. Review of a device used for determining worldwide monthly sunset and sunrise times, as well as the terminator. 11/82

G38 **DXing During Aurora** (2) Robert Kramer. All the facts and details about DXing during an aurora, including what to expect, what to look for, and a list of pointers. Although this thorough study deals exclusively with MW DXing, SWBC DXers interested in auroral effects on the Tropical Bands should find this article helpful. 4/83

G41 **A DXer's Guide to Headphones** (1) Dennis Kibbe. Discussion and a list of headphones currently on the market. 11/84

G42 **(Retail) Electronic Parts Suppliers** (2) Mark Connelly. Addresses of electronic part suppliers and their specialities, in alphabetical order. 1/85

G44 **Several DX Computer Programs** (6) Mark Connelly. Discussion and program listing for computer programs (in BASIC) to calculate sunrise/sunset times, Great Circle bearing/distance, and sort by frequency for loggings. 4/85

HISTORY OF RADIO

H20 **Radio History - 1912 to 1937** (5). Reprinted from the 1938 Radio Annual. Short notes on advances in the state of the art. This article covers early SW as well as Medium wave broadcasting.

RECEIVER MODIFICATION AND CONSTRUCTION

M1 **The Curse of the Superhetrodyne, and How to Hex It** (4) Joe Worcester. Describes some advantages and disadvantages of the superhetrodyne receiver. Then, suggests a modified TRF circuit as a possible solution. 3/71

M2 **Putting a Recording Outlet on Your Receiver** (1) Grant Manning. Describes how and where to attach a recording jack which bypasses the volume control of a receiver.

M4 **SPR-4 SSB Filter** (1) Grant Manning. How to modify a Drake SPR-4 to use the 2.4 khz sideband filters without turning on the BFO, and speed up the AGC response time. 5/74

M6 **Intermediate Frequency Transformer Alignment** (2) Jon Perkins. A step-by-step outline for aligning the IF stages of any receiver. 3/70

M7 **Selectivity** (1) Philip Sullivan. An introduction to the various methods of getting selectivity out of a receiver.

M9 **R-390A/URR Optimization and Alignment Check** (2) Charles Taylor. Explains how to align the RF and IF stages of an R-390A. 5/81

M10 **Modifying the Realistic TRF** (6) Gerry Thomas/Mark Connelly. Very detailed and specific instructions for aligning, improving the readout (to 10 khz), better selectivity, adding antenna connections and installing a S-meter in the TRF. 10/80

M11 **An Audio Switching Unit** (1) Nick Hall-Patch. Explains how to connect two receivers to a tape recorder in order to listen to either one or playback. 10/80

M12 **Tape Interconnection, the Right Way/An Attenuator Patch Cord for Taping DX** (1) Don Davis/Gerry Thomas. Install an input jack in a receiver to make use of its audio stage for playback. Construction of a patch cord for running radio outputs into the microphone input of a tape recorder. Most applicable to tube type receivers. 2/78

M14 **Mobilizing the SPR-4 Receiver** (1) Charles Taylor. Addresses problems associated with mobile operation of the SPR-4. Formulates solutions to antenna and power supply problems, and describes the construction of an antenna tuner. 8/78

M17 **Synchronous AM Detectors** (2) Nick Hall-Patch. Discussion of AM detection and the use of a phase-locked loop to improve reception of weak BCB signals. Includes schematics for several applications. 2/83

M18 **FRG-7 Mods** (2) Brian Aase/Ralph Sanserino. Describes modifications to the FRG-7 which improve the S-meter, selectivity, AVC and parallax. 10/80

M20 **R-390A Operating Procedure** (2) Charles Taylor. Complete description with notes and explanations. 10/80

M21 **More Thoughts on Tape Recording from the TRF and other Portable Radios** (2) Mark Connelly. Several methods are discussed, with diagrams. 12/80

M23 **R-390A/URR Vacuum-Tube to Solid State Power Supply Conversion** (3) Charles Taylor. Complete concise description for converting a R-390A power supply to its solid-state equivalent. Many good diagrams. 2/81

M26 **Antenna/Headphone Switching Units** (1) Derek Claridge/Mike Worst/Nick Hall-Patch. Outlines several methods for switching audio and antennas between multiple receivers and headphones. 5/81

M30 **A Crystal Calibrator** (1) Bruce Portzer. Circuit and description for a 100 khz crystal calibrator, with a modification for 25 khz markers. 1/82

M32 **R-390A 3TF7 Ballast Tube Replacement** (1) Steve Bohac and others. Several proven techniques for replacing this hard to find regulator tube. 11/82

M33 **ICF-6500W Selectivity Modification** (2) Gerry Thomas/Dennis Kibbe. Complete details and step-by-step construction for installing a narrow IF ceramic filter. Steps for improving the audio are also included. 2/83 and 11/84

M34 **Plessy SL 6700 IF/Detector IC** (2) Nick Hall-Patch. Description of the IC, schematic for a receiver IF amp/detector and an evaluation of the circuit. 4/83

M37 **ICOM R-70 Modifications** (1) Don Moman. Allows the SSB Pass Band Tuning filter to be used in place of the 6 khz AM filter and allow pre-amplifier to operate below 1600 khz. 8/83

M38 **Torrestronics TK-1 Digital Display Kit** (1) Randy Tomer. Review of kit. Describes how to use the counter on an HQ-180. 8/83

M40 **Two Sony Modifications** (1) Dennis Kibbe. Describes a technique for improving the selectivity of the 7600A by adding a crystal filter. 12/83

M41 **ICOM R-70 Mods** (3) Laurens Engel. Describes a number of improvements to the receiver, including RF input protection, enabling the pre-amplifier below 1600 khz, partial elimination of the RF attenuator below 1600 khz, reduction of low frequency audio, dial light on/off and dimming, and more dynamic filter selection for RTTY and AM modes. 9/85

M42 **Schottky Diode Detectors** (1) Nick Hall-Patch. Discusses the use of schottky diodes in the detector stage of AM receivers.

M43 **ESKAB PLAM Option for the ICOM R-71** (1) Don Moman. Discusses a commercially available detector stage for the R-71. 1/87

M44 **ICOM R-71 Mods, Tricks and Tips** (1) Guy Atkins. Describes some simple modifications and operating techniques for the R-71. 11/87

M45 **Kenwood R-5000 Modifications** (1) Don Moman. Several simple modifications to the receiver including LW/MW sensitivity improvement, front-end protection, SSB level increase and beep-tone adjustment. 12/87

M46 **Replacing the R-70's PBT Filter** (2) Gerry Thomas. Describes how to replace the ceramic filter in the R-70/71 passband tuner circuit to improve selectivity.

RECEIVERS

R3 **Hammarlund HQ-200** (1) Tom Garcia. Review. 9/73

R4 **National HRO-500** (1) Paul Daplyn. Review. 12/73

R5 **Drake SPR-4** (2) Robert Fischer. Detailed review. Includes selectivity curves. 11/72

R6 **Barlow-Wadley XCR-30** (3) Mike Hardester/Charlie Keleher/J. A. Worcester/Grant Manning. Reviews and notes on modification. 7/75

R15 **Collins R-392** (1) Ralph Sanserino/Phil Bytheway. Review. 10/80

R16 **Drake SSR-1/Autek QF-1** (1) Grant Manning. Reviews. 11/75

R17 **Yaesu FRG-7** (2) Bruce Portzer. Review. 9/77

R18 **Collins R-390A/URR** (5) Charles Taylor. Complete and detailed review. 7/79

R20 **Panasonic RF-4800** (1) Grant Manning. Review. 4/78

R22 **Panasonic RF-2200/RF-2600/RF-2900** (1) Bruce Portzer. Short reviews. 10/80

R23 **Realistic DX-150/160/Kenwood R-300/Layfayette BCR-101/Sony ICF-6700W** (1) Pete Taylor. Four short reviews. 10/80

R24 **Yaesu FRG-7000/Kenwood R-1000** (1). FRG-7000 is short, R-1000 is longer. 10/80

R25 **Modified FRG-7/FRG-7000 and FRG-7700/McKay Dymek DR-33C** (1). Reviews. 2/83

R26 **Hammarlund HQ-180/SP-600** (1) Bruce Portzer/Phil Bytheway. Reviews. 10/80

R27 **Radio West Modified SPR-4** (1) Randy Tomer. Discusses the improvement in SPR-4 performance due to Radio West's selectivity and AGC time constant modifications. See M4 for details on the modifications. 12/80

R30 **Sony ICF-2001** (2) Pete Taylor/Don Moman. Reviews. 3/81 and 10/81

R31 **Drake R-7** (3) Don Moman/Chuck Hutton/Craig Healy. Reviews. 3/81 and 1/83

R32 **A Comparison of Tube and Transistorized Receivers** (1) Bruce Portzer. Discusses the differences between tube radios and the newer solid-state sets. 10/80

R33 **Subjective Evaluation of FRG-7 vs FRG-7** (1) Louis Goldstein. A look at how the FRG-7 evolved over the years. 5/81

R36 **The Panasonic RF-3100** (1) Don Moman. Review. 7/82

R37 **The Yaesu FRG-7700** (1) Don Moman. Review. 7/82

R38 **Kenwood R-600** (1) Tim O'Hare/Bruce Portzer/Randy Tomer. Reviews. 9/82 and 11/82

R40 **Potomac Instruments SMR-11/Kenwood TS-430 Transceiver** (2) Karl Zuk/Don Moman. Review of a hi-fidelity BCB receiver with features that might interest a DXer and a review of a Ham transceiver with a general coverage receiver. 10/82 and 1/84

R41 **Panasonic RF-6300/RF-081** (1) Don Moman/Randy Tomer. Reviews. 11/82

R43 **Sony ICF-6500W - The Perfect Portable** (2) Gerry Thomas. Review. 2/83

R44 **ICOM R-70** (1) Don Moman. Review. 2/83

R45 **Kenwood R-2000** (1) Don Moman. Review. 2/83

R47 **Sony ICF-2002 (7600D)** (1) Dennis Kibbe. Review and first impressions. 12/83

R51 **Uniden CR-2021 vs the Sony ICF-6500W** (2) Gerry Thomas. Review of the CR-2021 and comparison with the ICF-7600W. 11/84

R52 **ICOM R-71A** (2) Don Moman. Review. 11/84

R54 **Kenwood R-5000** (3) Don Moman/Nick Hall-Patch. Reviews. 2/87 and 3/87

R56 **A Comparison of Five Receivers** (1) Glen Kippel. Compares the SP-600, HQ-180, R-388, RAX-1 and GE Superadio. 12/86

R57 **Sony 2010** (2) Don Moman. Review.

TECHNICAL

T2 **A Beginners Guide to the Ionosphere** (4) Father Jack Pejza. A simple explanation, with drawings and graphs, of how the ionosphere reradiates radio waves. 1/73

T3 **Skyline Blockage** (4) Father Jack Pejza. Discusses several propagation modes and their expected arrival angles. A technique is outlined for computing the effects of local geography on station reception. See also T14. 12/72

T4 **Power Distribution in an Amplitude Modulated Signal** (1) Angel Garcia. Method for calculating the distribution of power in a modulated signal. 5/69

T5 **Precision Frequency Measurement** (1) Ron Schatz. Describes a scheme for determining the exact frequency of a station using a Heathkit IB-1101 frequency counter. 4/72

T7 **Yes, SAH** (1) Glenn Hauser. A description of sub-audible hetrodynes, how to detect them, and how they can be used for determining frequencies. 12/71

T8 **DX Mathematics** (6) Dave Fischer. Details for using trig tables to calculate Great Circle distance and bearing. A brief description of radio direction finding is included. See also T12.

T10 **Spurious Responses and How to Recognize Them** (1) Michael Northam. Talks about how signals mix inside a superhetrodyne receiver causing stations to be heard on frequencies different from their carriers.

T11 **The Use of a Tape Recorder in DXing** (1) Arthur Peterson. Tips for the DXer detailing the purchase, use and maintenance of a tape recorder.

T12 **Easy DX Calculations** (1) Dave Fischer. A simplified version of some of the calculations found in T8. 5/74

T14 **Comment on FJP Equations for Arrival/Takeoff Angles** (1) Dave Fischer. Corrects an oversight in the computations outlined in T3. 8/74

T21 **A Simple Method of Finding the Great Circle Path and Distance** (2) Father Jack Pejza. Description of a quick method using map overlays. Includes map and overlays. 3/75

T22 **Summer Static, a Skywave Proposition** (1) Gene Martin. Discusses thunderstorm generated static and why the background noise level often goes down as dawn approaches. This article is of particular use to those interested in dawn enhancement DX on the Tropical Bands. 7/70

T26 **Relation Between Geomagnetic Measurements and MW DX Conditions** (2) Grey Scrimgeour. Talks about a potential correlation between Afr readings and BCB DX conditions. Although this article uses exceptional West Coast TA MW reception as a measure of exceptional propagation, SWBC DXers interested in propagation at Tropical Band frequencies should find this article useful. 1/68

T27 **Precision Frequency Analysis for the Medium Wave DXer** (2) Ron Schatz. Describes a technique for station identification by measuring exact frequencies. 11/75

T28 **WWV and You** (2) Bruce Portzer. Complete information on the services of WWV, with three charts and time table. 4/76

T29 **Inferential Frequency Measurement by Hetrodyne Analysis** (1) Glenn Hauser. An easy method to estimate station frequency by analyzing co-channel hetrodynes. 11/75

T31 **Precision Frequency Measurement in the Mediumwave and the Shortwave Broadcast Bands** (8) Charles Taylor. Complete rundown on PFM and how it is accomplished. 2/76

T32 **Auroral/Geomagnetic Activity and its Effect on MW Reception** (1) Gordon Nelson. Concise set of guidelines examining the effects of geomagnetic activity on BCB reception. This article, by one of the deans of the radio propagation field, should be very important to any SWBC DXer interested in trans-polar and high latitude propagation. 8/76

T33 **Silencing QRN from a Fish-Tank Heater** (1) Nick Hall-Patch. Describes a method for reducing line noise buzzes with a capacitor. 8/77

T45 **Nighttime Medium Wave Propagation by Ionospheric Refraction** (4) Randy Seaver. Article detailing radio wave propagation theory and ionospheric conditions. This article has a great deal of relevance to those SWBC DXers interested in Tropical Band propagation. 9/78

T46 **On Reflection and Refraction** (2) Randy Seaver. Do radio waves reflect or refract from the ionosphere? Both philosophies are discussed and conclusions are drawn. 1/79

T47 **A Method of Finding the Distance Between Two Places on Earth** (2) Father Jack Pejza. With these two charts, distance can be determined to within 50 miles. 2/79

T48 **Terrain Charts for Propagation Predictions** (1) Mark Connelly. Discusses how variations in the conductivity of local terrain can effect reception in certain directions. Includes chart for Billerica, MA. 8/80

T49 **What to Look for when Buying a Receiver** (2) Nick Hall-Patch. Talks about points to be considered before selecting a receiver. Sensitivity, selectivity, strong signal handling, readout, etc. are covered. 10/80

T50 **Strong Signal Handling** (2) Chuck Hutton. Discussion about strong signal handling in a receiver, and what can be done to improve it. 10/80

T51 **Audio Filters** (4) Bruce Portzer/Sheldon Remmington/Nick Hall-Patch. Includes introduction, reviews of Autek QF-1, MFJ SBF-2BX, SL-55, MFJ-752, Mizuho AP-M1, Laboelectron SF-0330, Datong FL-2 and Hildreth Engineering "CommAudio Processor" filters, and some schematics for "build-your-own" audio filters. Highly recommended reading for shortwave DXers and SWL's alike. 2/83

T52 **Gilfer GAR-7, KRS DD-2, KRS DD-1-4D** (1) Gerry Thomas/Nick Hall-Patch. Reviews of these commercial digital readouts for radios with Wadley Loops and 455 khz IF. 2/83

T53 **More Great Circle Calculations** (1) Richard Corry. Simple equations and a Basic program for a HP-25. 11/80

T55 **Diurnal Field Strength Calculations** (1) FCC. FCC method for calculating interference during sunrise and sunset skip. 2 charts and outline for use. 10/82

T56 **Great Circle DX Program** (3) Mark Connelly. HP Basic program to calculate Great Circle bearing and distance. The location of many US and world cities is included. 3/83

T60 **Ceramic Filters** (5) Marc Bergman. Discusses the performance of several commercially available filters. Includes actual lab measurements of their performance. 11/85

T62 **Sea Gain** (5) Randy Seaver. Explains why trans-oceanic signals are heard exceptionally well near the coast. Although the sea gain effect is most noticeable on low and medium frequencies, SW DXers interested in Tropical Band propagation may find this article very useful. 1/87

T64 **Relationships Between Solar Activity, the Earth's Magnetic Field, and Medium Wave DXing** (8) Randy Seaver. Discusses the factors affecting medium wave propagation and presents a statistical analysis of solar and ionospheric data from 1956 to 1986. This excellent article is just as applicable to SW as to MW and should be of great interest to any enthusiast interested in radio propagation at high latitudes or on trans-polar routes. 11/87

T65 **Computer-aided Tuner Design** (4) Mark Connelly. Describes a computer program for designing antenna tuners. 2/85

T66 **Q-Demystified** (4) Mark Connelly. Explains what "Q" is and presents a computer program for simulating tuned circuits. 2/85

T67 **Suppliers of Radio Tubes** (1) Nick Hall-Patch. List of mail-order sources of tubes for older radios. 3/85

T68 **Surplus Mechanical Filters** (2) Marc Bergman. Describes the performance of several commercially available mechanical filters for IF stages in receivers. 3/85

To order any reprints from the IRCA, please do the following. 1) Make a list of the reprints and the page counts (numbers in parenthesis after the reprint title) on a separate sheet of paper. 2) Total the number of pages wanted. 3) Multiply the total page count by the following rates:

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about the authors and editors

about the authors and editors

KIRK ALLEN **Newkirk, Oklahoma**

Kirk is 32 and married to Marsha. They have 4 children. He's employed by the Conoco Oil Company in the Building Operations Division. His main interests (outside radio) are family and friends but he is also an avid fisherman with emphasis on Black Bass.

Kirk was first introduced to radio by building a crystal set in Jr. High School back in 1969. He did a little SWL'ing shortly thereafter but developed no real committment to DXing then. He held radio amateur novice ticket (WN5FNT) from 1972-74. Kirk took a total hiatus from radio from 1974-81, primarily related to school, dating and hard partying. He got back into SWBC DXing in December 1981 and has been more seriously envolved since about September 1982 when he bought his NRD 515. Kirk especially enjoys DX'ing Indonesians and Latins. He has been a Co-editor for **fine tuning** since its' merger with OMDX in '86. He is currently using a 125' random wire antenna into a homebrew tuner. Kirk's totals as of August '88 are HIC 202, VIC 182 (NASWA). He welcomes correspondence from other DX'ers: Rt. 1, Box 108A, Newkirk, OK 74647.

JERRY BERG **Lexington, Massachusetts**

Jerry Berg is 44 years old, married, and has two children Evan, 17, and Laurie, 14. He is a graduate of Temple University and Georgetown University Law School, and is the court administrator for the statewide Massachusetts District Court system.

Jerry has been a SWBC DXer since 1958. He is a member of the NASWA Executive Council, author of various articles, and chairman of ANARC's Committee to Preserve Radio Verifications, a project designed to archive QSLs belonging to former DXers and save such material from loss or destruction. Jerry currently lists over 220 countries Heard and Verified on the NASWA Scoreboard.

CHUCK BOLLAND **West Palm Beach, Florida**

Chuck Bolland is married and the father of four children. He and his wife Julie have been married for seventeen years. They met while Chuck was serving in the Navy as a Communications Technician in San Vito, Italy. Julie is from nearby Brindisi. After getting out of the Navy in 1977, the Bollands settled in Lake Worth, Florida. At that time they had just two children, Carol and Charles Jr.. Their second pair of children, Jessica and Stephen, were born shortly thereafter. Chuck has worked for the U.S. Postal Service since 1977. His present title is Superintendent of Building Services. He manages a crew of 47 men and enjoys the challenge of his job.

Bolland continued:

Having such a large family, Chuck finds time to DX only in the mornings before everyone else gets up. His evening hours are usually spent answering questions for Stephen, his five year old, and with other family affairs. Chuck is an amateur radio operator with a General class licence. He gave up QSL card hunting a few years ago, but occasionally sends off a reception report to stations like Hong Kong Radio and Falkland Islands Broadcasting Service, whenever he hears them. He enjoys experimenting with antenna configurations and gadgets to improve his DXing capabilities. Chuck says he has "stumbled" upon a couple of unique methods of building receiving equipment gadgets that might help other shortwave listeners and he enjoys writing articles about these developements. He recently purchased a IBM PC compatible computer and has found that, rather than interferring with his DXing, it is contributing to it in a big way. His receiving equipment consists of a Hallicrafters DX100 and a NRD-525, recently modified with the ESKAB Synchrono Phase Locked IF modification.

JOHN H. BRYANT **Stillwater, Oklahoma**

John is 48 years old, a native Okie, and has been married to his nurse/wife Linda for 25 years. They have one child, Mary Ellen, who is currently a junior in college. Although John's home town is Stillwater, OK (their current QTH), John and Linda lived in Arizona, Illinois and Alabama before returning home a decade ago. John is Professor and former Head of the School of Architecture at Oklahoma State University. Beside architectural design instruction, John is widely known as an expert on the traditional architecture of East and Southeast Asia. In the mid-1970's, the Bryants spent a year in Japan where John was a Senior Fulbright Research Scholar. John has traveled extensively in China, both as a member of official US delegations and as a lecturer at a number of Chinese universities.

John has had two careers in the DX hobby. The first was as a teenager throughout the 1950's: John began in 1952 as a shortwave DXer but spent most of that era as a "medium waver." His best catch was 1YZ, Rotorua, New Zealand on 800 KHz in the winter of 1959. His second career in the DX hobby, mostly shortwave this time, began in 1979-80 with the purchase of a Sony 2001. He currently operates a modified NRD-525 coupled with a semipermanent 1200' Beverage pointed at the China Coast and Sumatera. Although he is enthusiastic about DX from anywhere, John couples his "real world" interests with his DX interests by being absolutely obcessed by DX from East and Southeast Asia. His other radio interests include antenna and propagation experiments. His current totals are 200 countries heard/176 countries verified from the "modern era."

John is the Editor of Special Publications for Fine Tuning.

DAVID CLARK **Newmarket, Ontario**

David is 42 years old and a university graduate in history and geography. He and his Ukrainian born wife Elena have four children, including their most recent Bundle of Joy, nine-month old Sarah Elizabeth. Although the Clarks live on a 10 acre wooded site (antenna farm) in the country, David works in downtown Toronto where he is Director of Systems Development for The Royal Trust Company.

Clark continued:

When he was 12 years old (1958), David became interested in DXing using his father's old 1940's floor console radio. He has gone through various DXing specializations over the years including foreign and domestic medium wave DX, the ham bands and SWBC. Since 1982, his primary interest has been DXing the Tropical Bands. He is very interested in the technical aspects of propagation in terms of correlating solar and geomagnetic activity and grayline criteria to actual reception exeprience. Within that area of interest, David focuses on transpolar propagation routes to Asia.

David is a Director of the Ontario DX Assocation and is International Loggings Editor for DX Ontario magazine. He is also a member of CIDX, NASWA, NU and FT. David says that he deeply values the personal relationships that he has established in the hobby, though his understanding Elena continues to refer (tongue-in-check?) to David and his fellow hobbyists as "DX FREAKS."

DR. HAROLD CONES **Newport News, Virgina**

In the real world, Dr. Harold Cones is a Professor of Biology and Chairman of the Department of Biology, Chemistry, and Environmental Sciences at Christopher Newport College in Newport News, Virginia. Trained as a biological oceanographer and benthic specialist, Dr. Cones classifies himself as a Field Biologist and prefers to spend his teaching time outdoors rather than in a classroom. He conducts 10 day extended ecology field trips (camping) to Maine in the spring and Florida in the winter. Dr. Cones is 45, married to a high school librarian, and has two daughters, ages 16 and 13.

In the dark underworld of shortwave radio, Harold is best known as Dr. DX, an oft-confused SWL who, with Mrs. Dr. DX and Daisy the DX dog, wages a constant losing war with AMTRAK (Dr. DX's exploits can be followed monthly in FRENDX). Harold began DXing in 1957 with a BC-312 tank radio, dropping in and out of the hobby until 1983 when he again began DXing in earnest. He uses a Yaesu FRG-7700 and a Drake R-4B and loves to DX on old tube equipment, including the Knight Kit Space Spanner, Ocean Hopper, and Star Roamer. Harold is the President of the Great Circle Shortwave Society (a nostalgia-based group that serves as a fraternity for the old WPE callsign holders) and publishes the **WPE Call Letter** quarterly. He is a member of the FRENDX Editoral Committee and has published a number of articles in FRENDX, as well as other hobby publications. Harold's favorite area of DX specialization is the far Pacific, however he will chase anything in the Tropical Bands. He has earned 40 FRENDX awards, heard 212 countries, and verified 201. He was the third place winner in the 1988 North American DX Championships and was the fifth place winner in the Rhein-Main Radio Club Tropical Band Contest. In addition to NASWA and Great Circle, Harold is a member of FT, NU, and the Old Dominion DX Association.

MARK CONNELLY **Billerica, Massachusetts**

Mark, now in his 30's, has been DXing since he received a 5-tube AM radio at the age of 10. His interests in radio and electronics led to a BSEE degree from Northeastern University and to a career as a test engineer in the field of computer - controlled Automatic Test Equipment (ATE), much of if RF - related. He is married and has a 6-year old son: he lives in a residential neighborhood about 15 miles northwest of Boston. Besides DXing (Mostly on medium wave), Mark is an active radio amateur and enjoys photography, music (current and old rock, Irish/English folk, classical), computer "hacking", gardening/botanical research, and various exercise-related activities.

Connelly continued:

Mark DX's from his home QTH and from his parents' at West Yarmouth, MA on Cape Cod during oncea-month (or so) visits. The Cape Cod location has proven to be excellent for European, African, and South American medium wave, long wave, 160-meter-amateur, and tropical band broadcast DX. Mark maintains that seaside locations are unbeatable for DXing below 4 MHz. He has numerous receivers and transceivers: major "workhourses" are the Yaesu FT 757GX transceiver and R390A, HQ180A, ICF2010, and R600 receivers. Mark has designed and built many antenna-related accessories such as phasing units and high-gain/high-Q regenerative preselectors: These have been amply documented in the pages of NRC's DX News and IRCA's DX Monitor. Mark has heard about 90 countries on medium wave (about 50 QSL'ed and has worked about 150 countries on the ham bands.

NICHOLAS HALL-PATCH **Victoria, BC**

Nick Hall-Patch is starting to push middle age, is married and has two daughthers aged 9 and 6 who have been known to assist in Beverage expeditions under the guise of "camping trips." He is a self-employed professional gardener in Victoria, B.C., The City of Gardens, and has little spare time, what with raising plants and children.

However, Nick has an ongoing interest in improving his MW DX reception. He DX'ed medium wave in the mid-sixties while in his teens, and has done so again since the early seventies. He has indulged in a good deal of experimentation with receivers and antennas since that time. He has been Technical Editor of the International Radio Club of America since 1978, and was editor of IRCA's A DXer's Technical Guide, published in 1980 and 1983. He is also a member of CIDX and LWCA, and counts Mongolia and Bulgaria among his better MW catches from his QTH, unfortunately eight years ago now. He prides himself on never having seriously DXed with a stock receiver.

CARL HUFFAKER **Mexico, D.F.**

Carl is now retired after a varied career in archaeology, geology, photogrammetry, research and development, government service, and consulting engineer. HE twice married, and twice widowed, and has three daughters by the first marriage and four step-daughters by the second. During WW II he was with the Air Corps in photogrametric development and in field operations of the world-wide mapping project. For the past 20 years, he has resided in Mexico and traveled throughout Latin-America applying American science and technology to Third World development. Publications include reports and papers in technical journals. Carl was on the USGS editorial staff for the "Topographic Instructions".

His chief interest in the hobby is designing and building radio equipment. He was an active MW DXer in the Newark News Radio Club during the early 50's, and for the past 8 years, has been active in SW. Carl is Latin American Editor for SPEEDX, and serves on the Board of Directors. He is a frequent contributor to hobby publications explaining the Latin culture and radio to their northern neighbors.

FRITZ MELLBERG **Hawarden, Iowa**

Fritz is a 43 year old pastor of the United Church of Christ serving a rural parish in Hawarden, Iowa, a small town north of Sioux City. He is married to Gretchen, and they have two girls, Emily 15 and Elizabeth 12. Fritz grew up in Mensha, Wisconsin and received journalism training at the Appleton (Wisconsin) Post-Crescent. He was a staff member of the United Church of Christ Office of Communication in New York City before entering the parish ministry. He attended the University of Wisconsin (B.A. 1967) and the Chicago Theological Seminary (M. Div 1972) Among his hobbies are woodworking, sculpting and carving, Fritz also collects old radio memorabilia. He has a massive collection of early radio tubes and a basement full of radio junk as well as a few working at Atwater Kents and Philco Cathedrals. Fritz also moonlights as a therapist at a local Substance Abuse clinic and on occasion teaches humanities courses at local colleges. He also collects Rock 'n Roll, Jazz and Classical Records.

He became interested in DX way back in the 60's when he heard a New York City station on his five tube bedside radio. He bought his first shortwave radio to listen to Radio Ceylon's rock n roll and keep up on the Green Bay Packers while serving in the Peace Corps in India back in 1968. But it wasn't until 1979 that he began to DX seriously. He has been a member of NASWA, SPEEDX, IRCA and NRC and has alternated his DX time between SWL and Broadcast Band DXing.

He gave up country counting at 160 and concentrates on the 60 meter band in the local evenings. Fritz has logged over 800 stations, 18 countries on Broadcast band in the last 6 years. Fritz collects taped segments of the stations he hears and has over 200 cassettes with tropical band Latins and broadcast band DX.

R. CHARLES RIPPEL **Virgina Beach, Virgina**

Chuck is 33 years old and is married (Beth) and has one 5 year old daughter, Ashley. After a period of employment with Northrup/Page Communications Engineers assigned to the Saudi Naval Expansion Project, Chuck became and currently holds the position of CEO for Great Atlantic Information Systems, Inc., in Virginia Beach, VA. He is also involved with other business interests.

Ckuck began DXing in 1972 with a Realistic DX-150 and was introduced to NASWA in 1973 by Ed Shaw. He was one of the founding members of ODDX, the Old Dominion DX'ers Association, located in Tidewater, Virginia. In 1974, he edited the CIDX column At Random and in 1987 he tackled DX'ers Forum for NASWA. Chuck currently chairs the Editorial Committee of NASWA. Over the years, he has contributed several articles to FRENDX including papers on Antenna Noise Bridges and Delta Loop theory and construction techniques. Additionally, he is a member of FT, ODDXA and the Great Circle Shortwave Society. Chuck currently use a JRC NRD-525 and an Icom 761. His antennas include a 130' inverted Vee fed with open wire, matched with a Nye Viking MB-V tuner and using a Palomar Antenna Noise Bridge. His main DX interests include SWBC from the South Pacific, Asia and Africa.

Chuck holds a number of NASWA awards including:

Senior Papua New Guinea DX'er (#007)
European Senior DX'er (#019)
Ecclesiastic DX'er (#003)

Emissora Nicional DX'er (#003)
All Continent QRP DX'er (#001)
Senior Nigerian DX'er (#002)

Rippel continued:

As another radio related interest, Chuck holds an Advanced Class amateur radio license (WA4HHG). As an amateur operator, his focus is on HF DX, UHF and VHF Terrestrial, EME and OSCAR transmission.

JOHN TOW **Pinson, Alabama**

John is all-too-rapidly approaching forty (the end of this month!)! He has been married to Barbara for over nineteen years. They have two sons, Andy, 18 and Dennis, 14. Their household includes five cats and a dog. John has a BS and graduate work in Physics. He has just started his fourteenth year of teaching electronics, telecommunications and photography at Jefferson State College in Birmingham, Alabama. He is also the faculty advisor/engineer for WJSR (91.1 MHz mono 100 watts). He has held a First Class/General Radiotelephone License for twenty years.

John began SWLing in the winter of 61-62 on a homebrew two transistor regenerative receiver. He progressed to his first DXing receiver, a Lafayette HE-10, that summer. His first QSL was the "Boy on a Llama" card from HCJB, followed very shortly by the P.E. registration "WPE9EWY." He amassed 46 countries verified by his 1966-77 DXing hiatus for college, Navy, marriage, etc. This improved to 66 by 1978 when he skyrocketed his stats to their present plateau: 163 VIC/189HIC (NASWA); 158/181 (EDXC). John has been a member of DSWCI, NASWA, LWCA, and FT. His favorite past time is SWLing, with photography, woodworking, sailing, and electronics following that order.

MITCHELL A. SAMS **Wichita, Kansas**

Mitch is 28 years old, married and the father of a two year old son, Matthew. His wife Sherri is a Kindergarten teacher. Mitch received a BSEE degree from the University of Arkansas in 1983 and works as a Radar Systems Analyst for Boeing Military Airplane Company in Wichita, Kansas. When not DXing, Mitch and Sherri enjoy fishing, snow skiing and travel.

Mitch began DXing 1972 when, as a Florida 5th grader, he was given a Revell shortwave radio kit as a birthday present. He's been fascinated ever since! Currently, he uses a modified FRG-7 and a modified HQ-180A. Mitch founded Ozark Mountain DX Club in 1980. OMDXC merged with Fine Tuning in 1986. Mitch now serves as Managing Editor of Fine Tuning. Using the NASWA radio country list, Mitch's totals stand at 216 heard and 150 verified. He especially enjoys DXing Indonesia and Asia. However, as his loggings show, Mitch enthusiastically DXs all areas of the world, occasionally spending time on MW, as well.

JERRY STRAWMAN **Cedar Rapids, Iowa**

Jerry was born in Des Moines, Iowa in 1948. He has been married to his wife Ardith for nearly 18 years. The family consists of a son 13, and daughter 16. Five birds and a guinea pig round out the Strawman household. Jerry taught instrumental music for five years. However, for the past 13 years he has been an insurance inspector for Equifax Services of Atlanta, Georgia. In addition to the radio hobby, he enjoys music, stamp collecting, and photography.

The radio hobby first bit Jerry in the late 1950's when he began to listen to far-away broadcast stations on a small, six transistor portable. He received his first shortwave radio, a Hallicrafters S-120, for Christmas, 1962. His current shack includes a Sony ICF-4920 portable, a restored Hammarlund HQ-150, and an Icom R70 receiver. Signals slide into his shack via 41 and 60 meter inverted Vee dipoles at 40 feet. Jerry considers himself more of a radio listener than a DX'er, but has an interest in Russian and Chinese regional stations, and broadcasters from the Middle East. He doesn't QSL, but has on tape more than half of the 268 radio countries he has heard on the broadcasting, amateur radio, and utility bands. Jerry is a member of the Canadian International DX Club and FT and is always happy to correspond with or talk to others about the radio hobby.

about fine tuning

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fine tuning is an organization dedicated to supporting the hobby of Shortwave Broadcast DX. Our main effort is publishing a bulletin weekly during the DX season and bi-weekly during the North American Summer. The bulletin, also called **fine tuning**, is a journal emphasizing **rare and difficult DX.** The bulletins focus on SWBC news but also contain news of unusual merit from the medium wave, Long wave, Ham, utility or TV DX communities.

There are 7 people involved with the actual publication of **fine tuning.** Managing Editor, Mitch Sams, maintains FT subscriptions, finances, the subscriber list and mailing labels, and sample requests. Publication of FT is handled by Larry Yamron. Each completed issue of FT is mailed from the current editor to Larry for publication and mailing. Larry also coordinates FT's annual publication "**DXERS GUIDE TO LATIN AMERICA**". Issue Editors include Dave Valko, Dan Sheedy, Kirk Allen, Bob Hill and John Wilkens. Behind the scenes, John Bryant is Editor of Special Publications and also in charge of production graphics work (such as the FT masthead).

Cost (US) per issue of the **fine tuning** bulletin is 60 cents in North America and 75 cents elsewhere (airmail). Minimum order of 20 issues ($12), and payable to:

FINE TUNING
PO Box 780075
Wichita, KS 67278 USA

Sample copies of the **fine tuning** bulletin may be obtained for an SASE.

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